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AECMAGAZINE

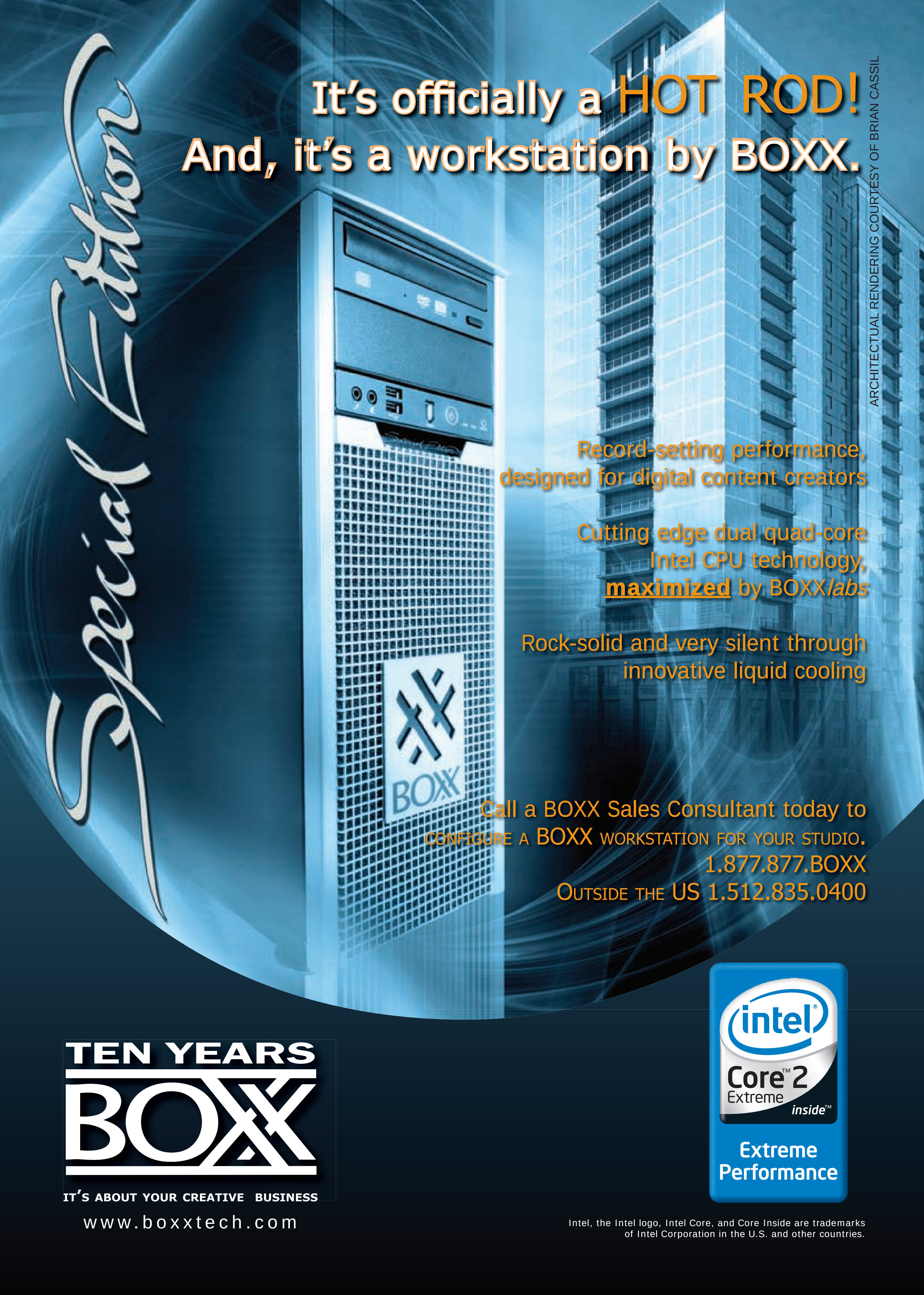
DESIGN, MANAGEMENT & COLLABORATION IN THE BUILT ENVIRONMENT



McNeel's flying circus

A report from the heart of the legendary Rhino developer

Bentley goes green / Acrobat 9 / Océ ColorWave 600


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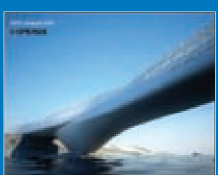
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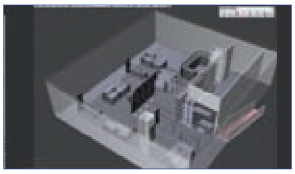
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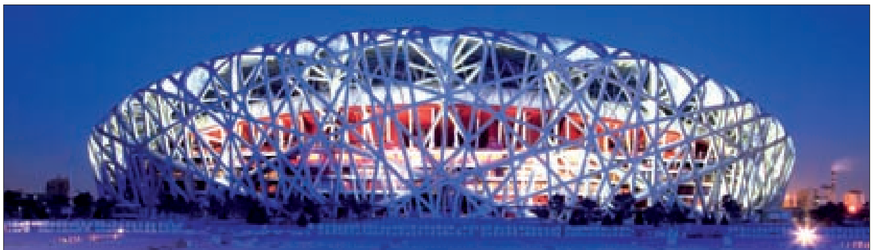
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Front cover image. Zaragoza Bridge Pavilion designed in Rhino by Zaha Hadid Architects, London and rendered in 3ds Max by Opersis

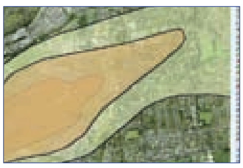
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RhinoTerrain 1.0 for Rhinoceros 4.0 released



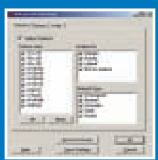
RhinoTerrain SARL has released RhinoTerrain 1.0, a plug-in for Rhino which enables users to generate and analyse 3D terrain models. RhinoTerrain provides support for input using points, lines and curves with hard breaklines and soft breakline options. It can work with large data sets, supporting several million input points and offers a number of visualisation features including OrthoPhoto mapping with geographical referencing. It supports automatic contour height annotation, and also makes use of multicore processors for larger terrains. ***www.rhinoterrain.com***

KIP delivers high volume large format printer



KIP UK has launched its KIP9000 digital printing system, which offers 600 x 600 DPI printing with advanced imaging algorithms for high quality reproduction of CAD data. It prints from all major software packages and includes native DWF batch processing. In terms of output delivers 22 A1 prints per minute. The KIP9000 can receive files electronically from anywhere in the world via a web browser. ***www.kipuk.com***

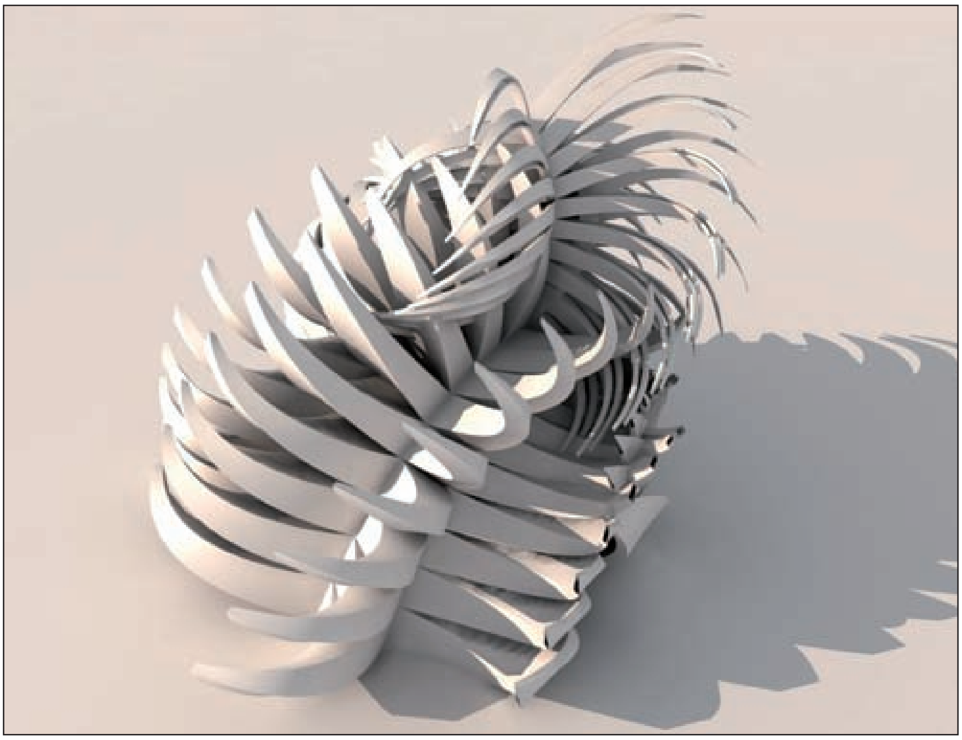
Structural Integrators boosts Revit's functionality



Structural Integrators has announced its SI Tools for Revit Structure, an add-in that provides advanced selection capabilities for structural members. The utility allows users to select all beams, columns, or walls on a single level or in the entire model, regardless of type or material. SI Tools for Revit Structure is available free to registered members of Structural Integrators and comes with four months free technical support for individual licenses. ***http://structuralintegrators.com***

The Wright stuff

Lancashire-based Eric Wright Construction has selected Autodesk Buzzsaw to help manage its projects portfolio. Part of the Eric Wright Group, the firm undertakes construction, development, civil engineering and facilities management projects ranging in budget from £1 million to £40 million. "Buzzsaw is user friendly and it's very familiar to our staff as it looks like any other Windows application," says Adrian Sewell from EWC. "Features such as the ability to comment on documents online and post the comments back to the originators, have been really useful for us, and having all the up-to-date information available in one place has been a real benefit." ***www.autodesk.co.uk***



Bentley Systems and Robert McNeel play the generation game

This month, the most exciting development area in architectural CAD, Generative design, has just got a lot more accessible. Two leading companies, Bentley Systems and Robert McNeel and Associates, have launched initiatives to spread generative technology into the architectural markets, at amazingly low prices.

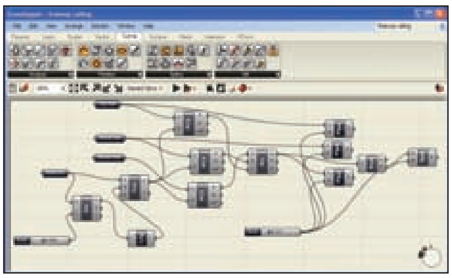
While there has been a lot of hype about Building Information Modelling (BIM) technology, the really sexy stuff that has excited the Signature architects has come from Bentley Systems with its innovative Generative Components (GC) extension to MicroStation. To push the technology into broader circulation, Bentley has just unveiled a special Discovery Subscription version of GC for non-Bentley customers. For a fee of $250 you get to download GC, which comes with a copy of MicroStation V8, together with a personal user license for one year. The fee includes access to online resources and learning materials, together with forums, blogs and wikis. If you are already a MicroStation subscription customer you can download GC for free. While the subscription does include a full working copy of MicroStation, before you pay to just get a cheap seat, we have been reliably informed that it only properly works in GC mode and turns off key functionality if you manage to start it up without the GC component.

"Thousands have taken advantage of our free trial download of GC that we introduced last year," commented CEO Greg Bentley. "They have experienced the ability to quickly explore a broad range of 'what-if' design alternatives, and their feedback has been most gratifying.

"To empower others to employ computational power through GC to discover their ideal designs, we have developed an extremely cost-effective program. To my knowledge, our Discovery Subscription is the first of its kind among providers of software for infrastructure. We are proud to offer it to architects and engineers around the globe eager to pursue a new approach to design."

GC was one of a kind but now Robert McNeel and Associates has just launched Grasshopper, a generative environment that's a free add-on for its popular Rhino modeling tool. Previously called 'Explicit History', Grasshopper has a unique graphical front end that requires no programming. As you plug together drag and drop 'boxes' the software writes the script in the background, which drives Rhino to generate the geometry or react in real-time to slider control. With so many seats of Rhino in contemporary architectural firms and the visual interface, we think Grasshopper will be a big hit.

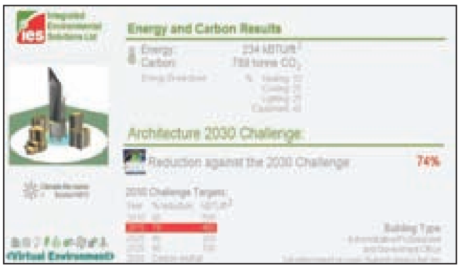
In addition, with Bentley's ex-Chief Scientist, Dr. Robert Aish now working for Autodesk, it's clear that we can expect another generative contender from the volume leader at some point in the future too. ***http://grasshopper.rhino3d.com*** ***www.generativecomponents.com***



Nesting of bended pyramids, created in Bentley's Generative Components by Martin Krcha, Zaha Hadid's Studio (top), and the Grasshopper graphically-driven generative environment for Rhino by McNeel (right)

IES launches free green building design software for Revit

IES (Integrated Environmental Solutions) has made a bold move to help promote its sustainable design software with the launch of a free downloadable tool called VE-Ware. With a view to introducing more architects and engineers to green building design, the software gives limited, but still useful, access to its <Virtual Environment> Apache thermal analysis software. This enables new and existing buildings to have their energy and carbon emissions assessed for free.



VE-Ware is designed to help increase the energy efficiency of the world's buildings, both domestic and commercial, by giving instant feedback on a building's energy consumption and carbon dioxide emissions. This assessment is based on real geometry, and uses international data on climatic conditions and the typical characteristics of different building, room and system types. According to IES it is ideal for use at early stages as it facilitates iterative design, allowing the comparison of different design, layout and system options.

IES says the data entry and outputs are managed for the user so that anyone can use VE-Ware to help reduce the energy consumption and carbon emissions of a building.

Initially only models exported directly from Autodesk's Revit platform can be accepted by VE-Ware. However, over the coming months this will be expanded to include other options for inputting the geometry data.

IES is claiming a simple step by step process for using VE-Ware. After insterting the geometry data, users tell the system where the building is in the world, then define the building type, construction materials, heating and cooling system types, and room types. Once everything is set up, a button is clicked for an automatic detailed thermal simulation and feedback is given on energy consumption, and CO2 emissions. The design can then be modified and different options assessed.

www.iesve.com/ve-ware

RC building design specialist adopts CSC's Orion

Matthew Consultants, a specialist in RC building design and part of the Walsh Group UK, has invested in CSC's Orion RC software. Established in Oxford in 1995, Matthew Consultants provide designs in reinforced, pre-stressed and precast concrete.

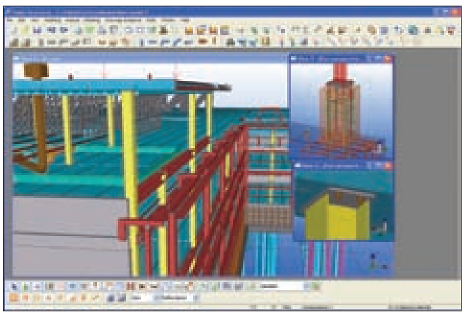
The company's investment in Orion was spearheaded by Pat Sharkey, Director at Matthew Consultants, who sees the many benefits of Orion; including the rapid load chase down to foundation level, the automated column/wall design and the quick assessment of lateral drift for their complex RC buildings. "We have always believed in proactively harnessing technology to ensure we maintain our market position, explains Sharkey. "Orion will enable us to provide answers to complex problems quickly and professionally. "Having a single model will also allow us to explore different options and deal with variations effectively."

Matthew Consultants already has access to CSC's Fastrak Building Designer software for the rapid and detailed design of steel building structures.

Meanwhile, licences for CSC's Fastrak Building Designer software have been acquired by Robert Bird Group. Integrating Fastrak with Revit will enable Robert Bird Group to control their drawing and design information within one model, whilst allowing both engineer and technician to work concurrently on their aspects of the project. CSC's S-Frame has also been acquired to give the Group advanced analysis capability when required.

www.cscworld.com

New GUI introduced for Tekla Structures 14



Tekla has unveiled version 14 of its Tekla Structures BIM (Building Information Modelling) software. The new release includes several improvements including a task-oriented user interface and menus, and improved tools for managing and sharing a BIM model between software users and construction project participants. According to Tekla, the software also enables users to work on models twice as big as before without the risk of running out of memory.

"Tekla is committed to continuous product development and to making Tekla Structures software easier to use and learn," says Tekla Executive Vice President P Risto Räty. "We release one main and one intermediate release per year in order to offer our customers the most advanced solution on the market. With Tekla Structures 14 I feel confident to say that Tekla models provide the highest level of constructability on the market."

www.teklastructures.com

HDR invests in 1,800 seats of Autodesk's Revit



Global Architecture and and Engineering Firm HDR is adding Revit as one of its tools for building information modelling (BIM) to improve productivity and collaboration across the firm. The three-year, multi-million dollar agreement includes close to 1,800 seats of the Autodesk software plus consulting services from both Autodesk and Avatech Solutions. The agreement also includes seats of AutoCAD Architecture and AutoCAD MEP.

www.autodesk.co.uk

AutoDesSys unveils new conceptual modelling tool

AutoDesSys, the developer of Form.Z, has previewed its BonZai 3D modeller tool at the AIA Convention in Boston. BonZai 3D is an offspring of Form.Z and, not unlike SketchUp from Google, is designed to fill the demand for a quick and easy entry into 3D. The product supports the conceptual and sketching stages of design as well as the production of accurate and robust models that can be used for construction drawings for 3D printing.

www.formz.com

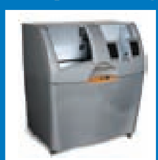
3Dconnexion adds support for VectorWorks



3Dconnexion's complete line of 3D mice now provide support for Nemetschek's VectorWorks 2008 design software: Designer, Architect, Landmark, Spotlight, Machine Design, Fundamentals, and RenderWorks. With 3Dconnexion's 3D mice, VectorWorks users can control and manoeuvre 3D objects, 3D designs and 2D drafts. Users can lift, press and turn the 3D mouse controller cap to fly through 3D space while simultaneously zooming and rotating the view. An increase in pressure accelerates motion, while a decrease in pressure slows motion for precise micro-adjustments.

www.3dconnexion.com

Z Corp demonstrates 3D printing from Revit



At the American Institute of Architects' 2008 National Convention and Design Exposition in May, Z Corporation demonstrated the new STL Exporter for Revit. Developed by Autodesk with support from Z Corporation, this new software utility lets architects and engineers "3D print" physical models of buildings and projects created in Revit. The STL Exporter for Revit generates a high quality STL file from models created in Revit Architecturem, Structure and MEP 2009 and is available from Autodesk Labs.

http://labs.autodesk.com

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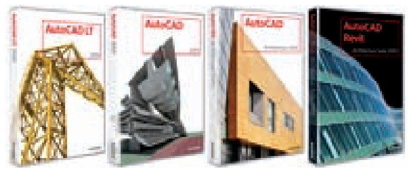


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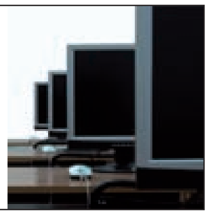
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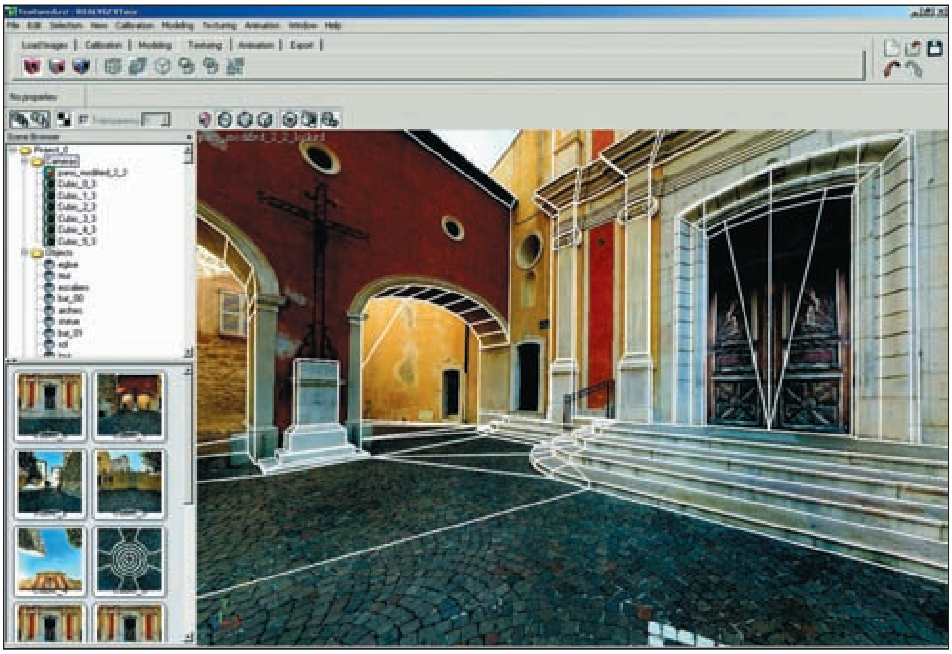
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Autodesk acquires RealViz



Autodesk has completed the acquisition of RealVIZ, the privately held developer of image-based content creation software. RealVIZ's technology provides ways to generate 3D content and visual effects from photo imaging and 2D environments. Its products are used for panoramic photography, image-based modelling, match moving and optical motion capture. Autodesk intends to develop and sell REALVIZ's Stitcher Unlimited, Stitcher Express, ImageModeler and Movimento software as standalone products. Matchmover, Retimer and VTour will no longer be available as standalone products; core technology from these REALVIZ products will be integrated into future versions of Autodesk's existing products, enabling customers to bring the real world into design environments. ***www.autodesk.com/realviz***

Bluesky models new market town in 3D



Using colour 3D printing technology fom Contex, Bluesky has created a large-scale model to assist with the planning of Sherford, a new market town on the outskirts of Plymouth. The model combines up-to-date aerial photography of the development site and its surrounding area with highly detailed height measurements, to create a geographically accurate, physical model. ***www.bluesky-world.com***

Graphisoft to ship ArchiCAD 12 in July

ArchiCAD 12, the latest version of Graphisoft's Virtual Building modelling solution, will ship on both Windows and Macintosh platforms in July.

The new release focuses on three main areas, that of speed, design and documentation. Multi-core processor support is designed to boost performance in 2D and 3D navigation and 3D model generation including sections and shadow casting.

A new curtain wall tool enables users to design and document curtain wall systems. The Curtain Wall tool is based upon the new ArchiCAD "System Technology" which will serve as a foundation for future system oriented building components.

In addition, a new 3D Document capability allows users to use any 3D view of the model as the basis for creating a document where dimensions, annotations and even additional 2D drawing elements may be added.

"Beyond delivering powerful new 3D design tools, we are also introducing an innovative 3D documentation capability, which has the potential to revolutionise communication in the building industry," said Miklos Szovenyi-Lux, Director of Product Management, Graphisoft. "And on multi-core computers, operations such as view generation of sections and elevations from the Virtual Building Model experience a dramatic performance increase."

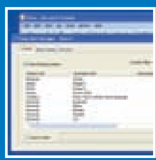
Look out for a full review next issue. ***www.graphisoft.com***

Philips drops the 3D glasses for new display



Philips has introduced a new 3D display technology which enables users to view models in 3D without the need for specialist 3D glasses. The company's WOWvx 3D uses a new generation slanted multi-view lenticular lens in conjunction with a standard hi-definition panel to deliver 3D images that can be viewed from all angles. The system currently works with 3ds Max and Maya. ***www.wowvx.com***

Gensler signs agreement for Oasys Mail Manager



Gensler, a leading architecture, design, planning and consulting firm, has entered into a global agreement for Oasys' email management software Mail Manager. The deal provides access to Mail Manager to all of Gensler's 3,100+ staff in 30 offices around the world.

CIO Ken Sanders said, "After assessing many products and engaging in an extensive trial involving 200 staff, Mail Manager stood out to us as the best tool on the market for our design teams to manage and archive their email. Email has become an essential form of business-to-business communication, and leaving emails that often contain critical project information in separate Outlook inboxes is equivalent to leaving letters piled up on desks." ***www.oasys-software.com/mailmanager***

BlueCielo releases InnoCielo 2008 suite

BlueCielo ECM Solutions, a specialist in Engineering Content Management (ECM) solutions, has released InnoCielo Meridian Enterprise 2008 and InnoCielo TeamWork 2008. The newest versions of both software products feature easy user management, Microsoft Outlook integration (which enables users to store email messages and their attachments directly into the InnoCielo vault) a Data Import Tool and support for the latest CAD software versions. BlueCielo's flagship software InnoCielo Meridian Enterprise 2008 also includes configurable Folder Types and offers the brand-new InnoCielo Email Manager module. ***www.bluecieloecm.com***

Intel's Nehalem to mark return of HyperThreading

Details have emerged of Intel's next generation Quad Core CPU, codenamed Nehalem. Due to ship in Q4 this year the new processor marks a return to HyperThreading with Nehalem having a total of eight logical cores. Intel is estimating a 20-30% boost over Penryn, its current chip. ***www.intel.com***

Bentley Empowered 2008 conference report

Bentley's annual customer event was held in Baltimore this year. Called Bentley Empowered, the main focus was on Sustainable Infrastructure; environmental challenges and opportunities ahead for construction. **Martyn Day** reports.

Starting last year at Autodesk University and moving doggedly onwards, the Green bandwagon has quickly made its way across the prairie of every CAD vendor's conference agenda. That is not a complaint, I am really happy that this is the case, as talking about the problem is perhaps the start of addressing the global issues that we face.

Going 'Green' is a great opportunity for all software vendors to add great analytical functionality to their products. After having acquired so many of the leading analytical developers Bentley has great potential to provide essential products to assess design performance and environmental impact.

Bentley is also an important CAD vendor to get involved in this messaging, due to the kind of clients it has. While it may have substantially less seats sold than the volume empire of Autodesk, Bentley's corporate customers get involved in huge multi-billion dollar markets and projects. This represents Big business reacting to the market conditions and the implications of 'sustainable design', even before there's much of a legal infrastructure to enforce it.

This was the second time that Bentley had brought its customer event to Baltimore and this year the company worked hard to do its best to earn its green credentials. It turns out that 65% of local Bentley colleagues travelled to Baltimore via bus or carpool and only hotels within walking distance of the Baltimore Convention Centre were contracted for attendees.

There was the onsite recycling name badges and lanyards at BE Conference and the brochure printed on Forest Stewardship Council (FSC) certified paper. The registration counters were seeing their third year of usage and water jugs and recycled paper cups were everywhere! Bentley has committed to reducing its carbon footprint by 15% before the end of 2009, based on its 2006 levels.

"It turns out that 65% of local Bentley colleagues travelled to Baltimore via bus or carpool and only hotels within walking distance of the Baltimore Convention Centre were contracted for attendees."



CEO Greg Bentley said that Sustaining Infrastructure was not just a buzz-term or new mission but an enduring commitment for the company.

Sustainable keynotes

The first morning's keynote addresses were an interesting mix of Bentley execs and a Green business guru, Andrew Winston, author of 'Green to Gold — How smart companies use environmental strategy to innovate, create value and build competitive advantage'.

CEO Greg Bentley was up first to report on the company's performance, outlook on sustainability and the challenges the company faces. Greg Bentley said that Sustaining Infrastructure was not just a buzz-term or new mission but an enduring commitment for the company.

Bentley talked of how he believed that sustaining our environment is not incompatible with sustaining our economies, given the necessary infrastructure investments. He added, "I'm a believer in global markets, so I personally believe that the financial returns on infrastructure investment – exemplified by the opportunities in clean energy self-sufficiency, efficiency, and conservation – are sufficiently high that these investments will inexorably be forthcoming.

"I even believe that these superior returns will motivate continued institutional reforms to encourage public-private partnerships in those infrastructure domains that have been traditionally funded only through taxation. I have no doubt of the multiplied opportunities that lie ahead for all of us, as a result."

On the company's performance, Bentley Systems has generated continuous revenue growth, at a compound annual rate of 14% over the past 15 years. In 2007, it had revenue growth of nearly 16%, to $450 million.

As Bentley is the largest privately-owned software company in the USA it does not have to report to the markets, so this yearly report is the main source of Bentley's annual performance. The company has 2,800 employees working in 51 countries, with the majority of its business and employees being outside North America. Greg Bentley also said that over the past 15 years the company has invested over one billion dollars in R&D and acquisitions.

Following on from Greg Bentley's belief that sustainability can be achieved without impacting business, Andrew Winston came on stage to highlight companies that are doing just that.

Maybe it's my European sensibilities that found the whole profit from going green a little distasteful but Winston's presentation did slowly win me round, or at least explain to me how a capitalist mindset can justify what needs to be done and how



Andrew Winston, author of 'Green to Gold — How smart companies use environmental strategy to innovate, create value and build competitive advantage'.



business must adapt.

In Europe we are used to Government intervention and legislation, while America still prefers the free market and less interference with business.

In the UK we have Part L of the building regulations driving environmental design, while the US has LEED accreditation which is completely optional.

Building regulations in the US also vary from city to city. That said, the US Federal Government and some cities (3,500 mayors) are stipulation LEED compliance on tax-payer funded projects. Winston was especially scathing of companies that marketed green but were in fact brown — highlighting one example of a garbage (rubbish) bag company that claimed to have bio-degradable plastic sacks.

To degrade they required sunlight, so in a landfill they had little chance of degrading!

Winston was all about building an 'Eco-advantage mindset' – this may well be business-guru babble but I figure anything to get the pure-business minded on-board is a good thing. We were given a copy of the book and I've started to read it, despite my early scepticism.

As if looking for a reward for recycling the use of the word 'sustainable' to new levels, Keith Bentley, CTO, took to the stage and talked about Sustainable Software. I thought that this was going to be a hammer-hit too far on the sustainable nail, but hey, this is Keith Bentley and Keith doesn't do marketing waffle!

In fact, Keith Bentley made a very interesting pitch explaining the long-term view to development that

Above: ***The 'six sins' of greenwashing. Make sure your actions reflect your marketing.***



Right: ***Buddy Cleveland is Senior Vice-President of Applied Research also spoke at the event.***

"Bentley rarely gets the recognition that it deserves for its technical prowess in limiting customer pain by rarely altering the file format, actively supporting other vendors' file formats as native and generally providing stability of its platform."

Bentley takes versus other companies that were not mentioned. Bentley rarely gets the recognition that it deserves for its technical prowess in limiting customer pain by rarely altering the file format, actively supporting other vendors' file formats as native and generally providing stability of its platform.

This is absolutely essential given that the kind of projects that MicroStation gets used on can last years, if not decades. Keith Bentley recommitted to continued development without the pain. As is usual with Keith's addresses he gave some insight into future hardware requirements: dual if not multi-core machines, Windows Vista and 64-bit.

Athens

The next release of MicroStation, due Q4 2008, got another airing. I'm sorry there's no pictures of it here, I did ask, but I was told Bentley were not promoting it yet, despite showing it to 6,000 people last month and 6,000 the previous year in BE, Los Angeles. Athens will be mainly an under-the-hood release with re-architecting for consistency of big datasets, federated distribution, complex workflows, user interface, breadth and depth of services and functionality.

The big feature focus remains on conceptual design tools, dynamic views, distributed projects management, and built-in geo-coordination.

Generative Components

This wouldn't be a Bentley report without something on Generative Components (GC). The big news on GC wasn't launched at BE but a few weeks prior at the American Institute of Architects (IAI). Called the Discovery Subscription programme, for $250 (if you are in the US), you can download MicroStation and GC and learn all about the innovative parametric design application that everyone is talking about.

Since the departure of Bentley's chief scientist, Dr. Robert Aish to Autodesk, Bentley's GC marketing has gone into overdrive and it wants to spread the GC word everywhere. Although you get a full copy of MicroStation, it has to be used in GC mode.

BE Communities

The new BE Communities website is Bentley's attempt to create a web destination for infrastructure community members to connect, communicate, and learn from each other. There are Forums, Blogs, a Wiki and Resources. With a corporate culture akin to Intergraph or IBM, this is a positive move on behalf of Bentley. Many of the bloggers have interesting opinions and there are some personalities worth knowing. Unfortunately, the look and feel of the site isn't perhaps as relaxed as I would have hoped but it's a start to establishing a more personal relationship with its clients.

The last point to mention here but the first thing I noticed at the even was Bentley's new logo, colours and marketing. After a long hiatus, Bentley is back into marketing itself to the outside world, with some new executive appointments and a company revamp.

This literally happened a few months before the BE event and so it's not fair to judge what direction or vision Bentley will be aligning with. After years of concentrating on its installed base, it seems that the company is now keen to promote its image and products in a more aggressive way, which is good news for those customers frustrated with Bentley's self-imposed lack of visibility.

While much can be said of jumping on the green bandwagon, it is Bentley's massive armoury of analysis tools that stand the company in good stead to deliver probably the most comprehensive suite of compliance tools to the building and infrastructure markets. If we take BE 2008 as the call to arms, next year I expect to see the company start to better-integrate its suite of analytical tools across its product set.

www.bentley.com

In the next issue of AEC Magazine we will look more in depth at Bentley's BIM and Beyond vision, which was presented in a break-out industry session.

McNeel's Flying Circus

While many big CAD vendors wielding hefty corporate marketing budgets have come and gone in the past 20 years, small developer Robert McNeel & Associates has managed to carve out its own niche with Rhino and AccuRender. **Martyn Day** recently visited the company's Seattle HQ.

Having written about CAD and design technology for the best part of twenty years, you can't help but get very familiar with the inner workings of the CAD developers, how development happens, marketing is oriented, and how the route to market and sales are achieved.

There are a few basic models and principles that seem to permeate through 99% of the industry. But then there is Robert McNeel and Associates, a company that appears to swim against this tide like an Alaskan Salmon dodging all the hungry bears to the spawning grounds. The consensus from competitors is that it shouldn't exist the way it is run, but somehow it does and very successfully.

I've known Bob McNeel for the best part of my journalistic career and you don't have to look much further to discover the reason for McNeel & Associate's different take on the market. Bob McNeel is a trained accountant who fell into what turned out to be a very successful AutoCAD dealership in Seattle back in the 'good old days' of early AutoCAD.

McNeel hit my radar when his company started to develop AutoCAD add-ons and I reviewed AccuRender, its photorealistic 'inside AutoCAD' renderer when it was launched in the UK market.

A few years later McNeel began to develop a 3D NURBS (Non-Uniform Rational B-Spline) modelling package named Rhino. For years it was in development and the betas were all given away for free. I remember talking with Bob McNeel on what the give-away business model was about.

At that time nobody gave software away and people were telling him that he was insane to do it. Bob was happy to get the software out there for people to find uses for it and let that drive development. After three years Rhino eventually went commercial for a very reasonable price and, against all odds, the people who had been using it for free started to buy it.

Today, McNeel claims to have 250,000 Rhino users worldwide, covering diverse industries such as marine, apparel, product design, jewellery design, analysis, CAM and architecture.

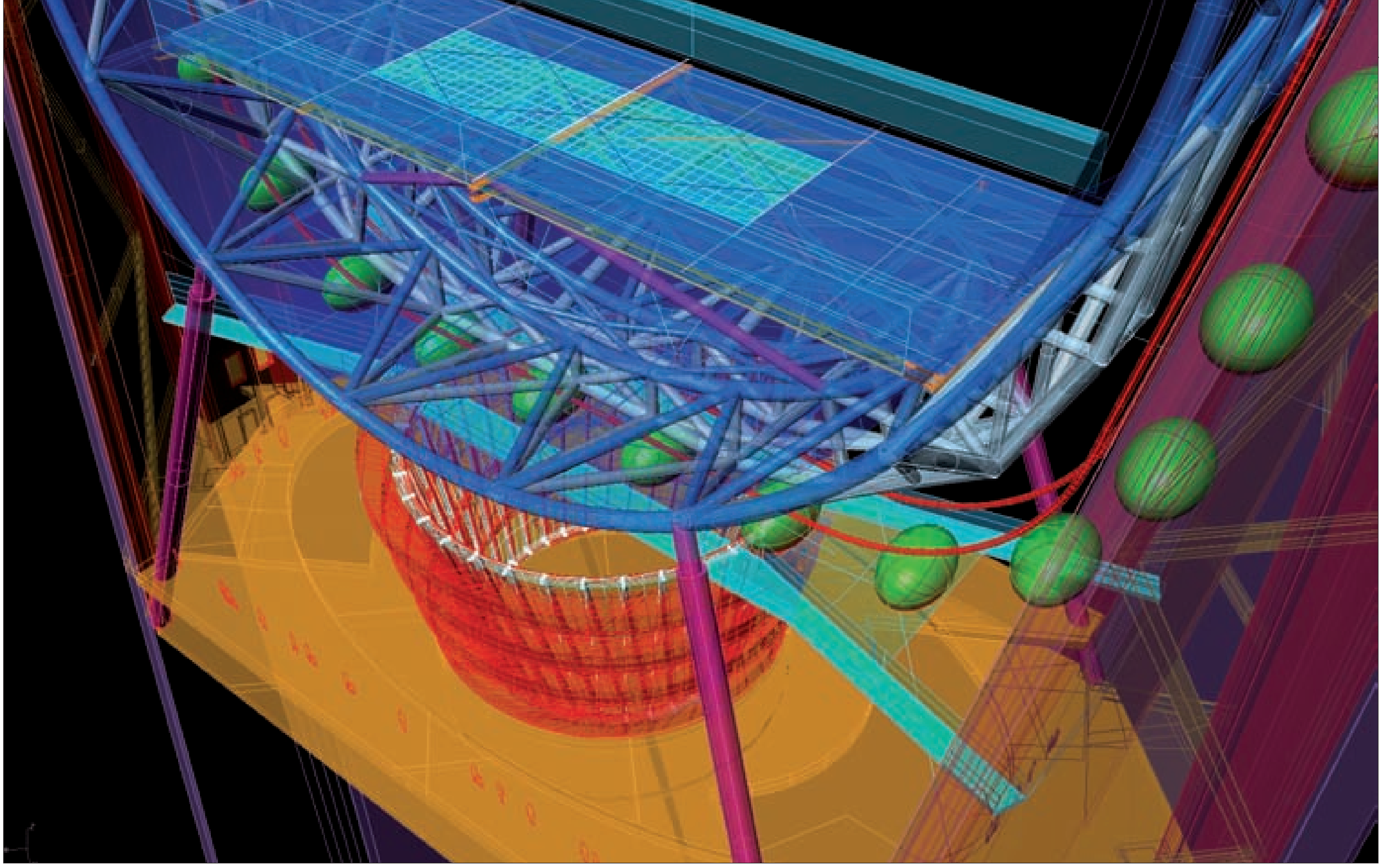
McNeel & Associates is now out of the AutoCAD dealership game. Autodesk moved to limit dealers selling out of fixed distance from their offices, which reduced their potential to grow, unless they opened multiple offices. Then the move to AutoCAD verticals arrived, with ever increasing targets, and with the Rhino software business growing the AutoCAD/Autodesk relationship terminated. However, old and new clients still request AutoCAD training on old versions of AutoCAD.

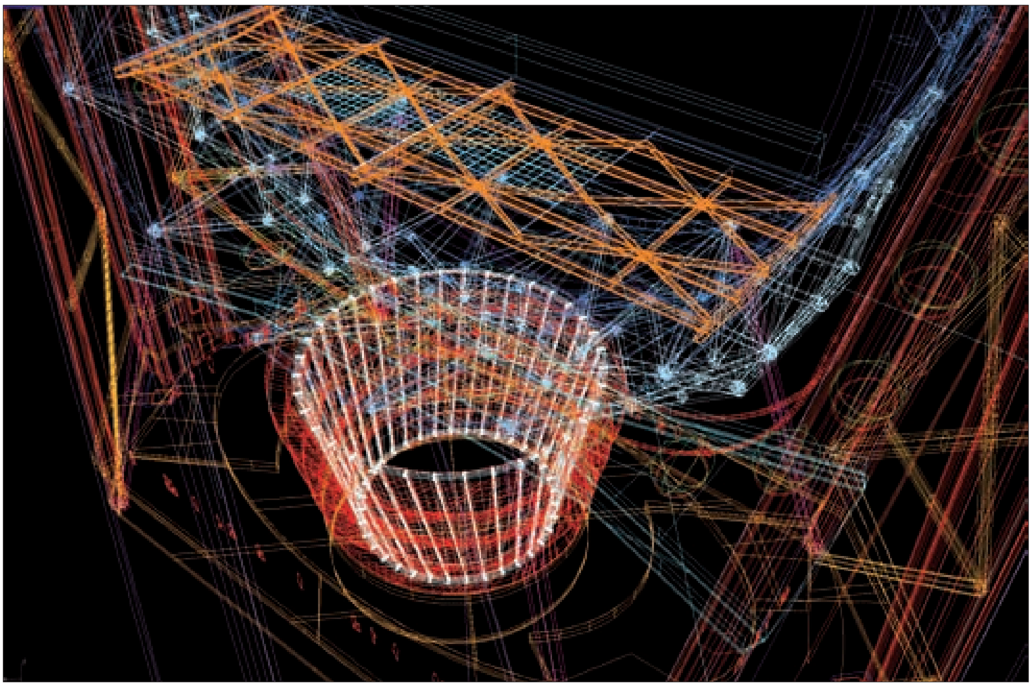
Since Rhino was launched, McNeel & Associates has built a whole ecosystem around Rhino and its rendering products. In many ways it's like Autodesk in the early days, with the vendor working on the core product and the third-party developers plugging

"While many industry people thought Bob McNeel was mad to give away Rhino for so long, you'd be hard pushed to now find a CAD software company that doesn't give early versions away on labs to measure reaction."



Corus Bausysteme GmbH, modelled in Rhino.





Kohn Pederson Fox Shanghai World Financial Center, modelled and rendered in Rhino.

into the application and adding functionality to tailor it to a specific vertical. There are already well over a thousand developers working with Rhino and extending its functionality around the world.

McNeel has also expanded its range of products, adding other animals, such as Flamingo, a ray trace and radiosity rendering engine for Rhino, and Penguin for a conceptual sketch look and feel, as well as stylised renderings.

Then there is Bongo for animations and Brazil, a Splutterfish rendering add-on for Rhino. For those with multiple licenses, there is a product called 'Zoo' to manage your software.

McNeel and Associates continues its commitment to broad free beta software and within weeks of a release being formalised, the next generation of technologies under development usually get shipped as a beta. With Version 4 out, version 5 is available on the company's Labs page.

AccuRender

For those of us that are long in the tooth, and pre-dating McNeel's fascination with animals, AccuRender was probably the first scan-line rendering application we used in AutoCAD. It had fractal trees, textures galore and quick results. Even though Autodesk competed aggressively against it, it ended up owning its own OEM license when it acquired Revit, as AccuRender was built-in as the default renderer.

In fact, Autodesk has only just replaced AccuRender in Revit with mental ray. That actually seemed to nark Bob McNeel as Autodesk failed to update the rendering engine for years, despite their license agreement allowing them to include the latest versions.

While the name might be old, the technology is not and has always been updated. McNeel and Associates has expanded its reach too under the guise of AccuRender nXt – the next generation. Scheduled to work with AutoCAD 2007- 2009, AutoCAD 64-bit, SketchUp, Revit, Rhino and IntelliCAD, the next AccuRender is in development and beta participation is free.

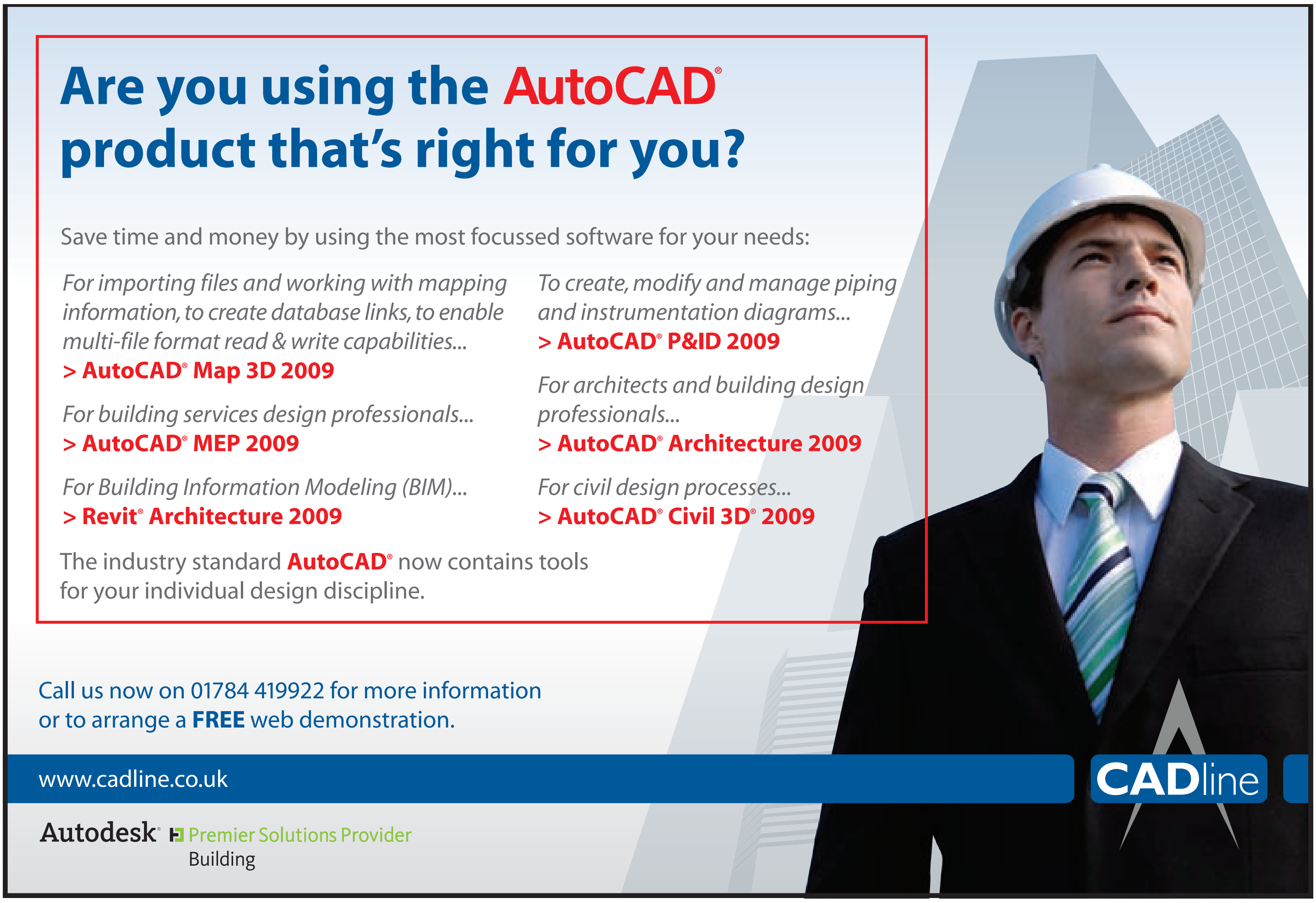
There is a brand new engine, which runs four to five times faster, is capable of working on larger models with support for multi-cores and handles threads a lot better than previous releases. The new algorithms anti-aliased image quality is looking very good already and renders are continually refined until the user stops the process. You can expect better tone reproduction and materials, fewer artifacts and a new User Interface. Daylight renders benefit from a new HDR algorithm, with better indoor day lighting too. Indirect lighting without using Radiosity is also possible.

New DNA

The big news is that there is a new animal about to emerge: Grasshopper. Again a technology for Rhino, Grasshopper was a development preciously named Explicit History and targeted Generative design. For those familiar with Bentley's Generative Components, Grasshopper is along those lines but without the programming. Bob McNeel calls it Visual Basic, without the Basic.

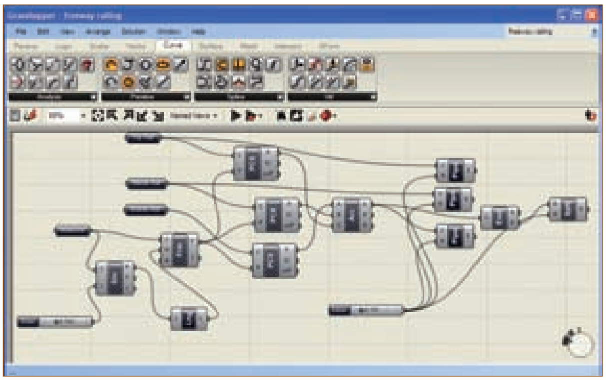
There has been a lot of interest in Generative design systems in the architectural world. Dr Robert Aish, while at Bentley, came up with Generative


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Kunsthaus Graz, Peter Cook and Colin Fournier. Designed in Rhino.



Users don't need to know how to program to create a parametric model using Grasshopper as there is a window for creating what amounts to a bank of geometry 'effects peddles', as you would with a guitar.

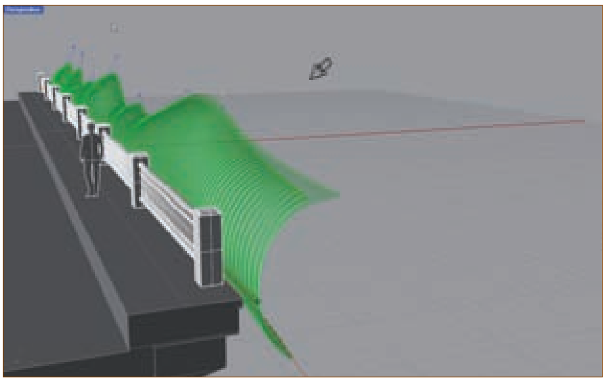


Image: Railing, derived from the schematic displayed above.

Components and now Autodesk has hired him he has a similar task to perform using Autodesk's technology (we presume built-on either Maya or 3ds Max).

Generative systems so far all require expertise in both geometry and programming, to write the applications that either derive the form or give the software boundaries and geometric relationships to allow designers to interact with the framework of a design.

With Bentley already there and Autodesk in hot pursuit I was pretty amazed to see an early demonstration of Grasshopper in Rhino last year. The output appeared to be similar to GC but the way the scripts are generated was amazingly 'plug and play'. You don't need to know how to program to create a parametric model using Grasshopper as there is a new window for creating what amounts to a bank of geometry 'effects peddles', as you would with a guitar.

You take the input, which may be a line and you literally plug it into an effect, which can be any kind of mathematical transform, and which can subsequently be plugged into other mathematical effects peddles, all driving the creation of a script (in the background) that drives Rhino's geometry engine. It's all drag and drop and plug and play.

The system uses some specific terms, namely Parameters, Components and Connectors. A parameter stores data; a Component contains an action; and a Connector connects 'Ins to Outs' or 'Outs to Ins'.

The Components can be selected from a range of mathematical functions (Tan, Cos, Pi, Divide, Sine, Log etc.) or entered by the user with X, Y and Z. Variables can be assigned to sliders allowing you to play with the important underlying geometry. One other interesting way of driving the system is the ability to draw curves and plug those into the effects boxes. So while you might not know how to fully express an equation, you might be able to draw the output or input that you want. I have not seen anything like this in GC.

What you end up building is a series of wired up boxes which drive the geometry creation. This could be merely to create a form or to make a dynamic environment – perhaps a planar wall that deforms when placed in proximity to another piece of geometry. All the time the Rhino viewport displays the results of this plug and play visual scripting, giving constant feedback.

The great news is that, as this is McNeel & Associates, Grasshopper is free and is considered part of the core program. With the sheer number of Rhino users in architectural firms and its position as a mainstay in Universities, expect to see a lot of users adopting Grasshopper for Generative design.

Bentley recently introduced a $250 downloadable version of Generative Components to spread the word (which actually includes a full copy of MicroStation, but is only functional in GC mode). It seems that the fight has been joined at the 'grassroots' level of adoption. Perhaps this is the reason behind the naming? Although Bob has mentioned that in the 70s TV series there was a character referred to as Grasshopper – the loan Kung Fu monk who always sorted out problems - and I can see how Grasshopper could be seen as Kung Fu for architectural geometry!

While many industry people thought Bob McNeel was mad to give away Rhino for so long, you'd be hard pushed now to find a CAD software company that doesn't give early versions away on labs to measure reaction. Autodesk's path to volume is to trial the software on its labs site and then launch and sell rev 2 of the product.

Even now, the rapid appearance of the Rhino version 5 beta, just as Rhino 4 ships is unheard of. It's based on really enthusiastic users always wanting more and happy to play with forthcoming technology. However, again, to be doing this without a subscription model in place would have the big CEOs weeping into their cornflakes with all that missed opportunity to ratchet up the income dollars.

When I arrived in the offices of Robert McNeel & Associates in Seattle, Bob was on the phone, telling the caller that Rhino probably wasn't the best option for what they were looking for and that he (or she) should probably look for a specific vertical application for the industry that they were in as it might do more. Throughout my two days with Bob and the development team I was trying to figure out why this laid back approach to developing and selling CAD tools worked. In the most capitalist nation on the planet McNeel is an anathema to corporate culture. There is almost a total lack of greed and it's incredibly refreshing.

While CAD vendors spent millions in marketing, McNeel & Associates doesn't, instead preferring their customers to be the product's 'marketeers', spreading the good word by mouth and if that's a slow process then so be it. The McNeel ethos is to listen to the customers, help customers, because if the customers are happy, the products do well. It's not about milking customers.

To date, McNeel & Associates has done well to stay below most of the big CAD vendor's radar but with increased market coverage and new products that directly compete, like Grasshopper, the company is bound to become a competitive target. Can these vendors compete against the mature, low-cost products McNeel creates or establish such a community of happy users to drive development? Somehow, I don't think Bob has sleepless nights in Seattle over it. ***www.en.na.mcneel.com***

Acrobat 9 Professional Extended

Adobe's latest version of Acrobat further expands the capabilities of the PDF format for 2D and 3D CAD users. **Martyn Day** evaluates Acrobat's entertaining new set of tricks.

Over the past three years, digital technical documentation software and collaboration tools developers have carved a niche in the design industry. As CAD systems have expanded from 2D to 3D, encompassing increasingly rich streams of project and 'meta' information, there has been a corresponding requirement for ways in which to effectively share and express these rich ideas to teams and suppliers, both locally and globally.

Adobe believes that for every document creator, there are, on average, 50 consumers of that information.

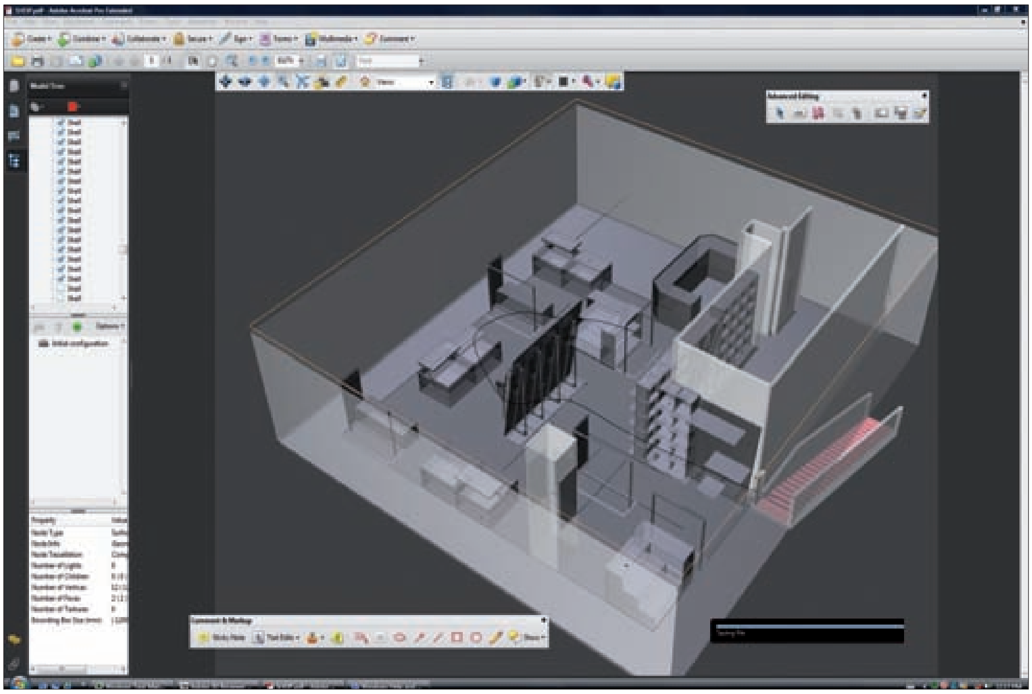
The PDF (Portable Document Format) was born in 1991 out of the invention of PostScript, a format that Adobe invented to enable the easy printing of graphics and text in a 'dot matrix' computing world that had no printing standards. PDF has grown from this standardised description of text and graphics to be a digital equivalent to printing because you can create a PDF from nearly any application and be sure that whoever you send it to will be able to see the layout as intended. By continually adding support for professional applications and many different proprietary formats, PDF has become an extremely rich communication medium for project information irrespective of source.

For the last three versions of Acrobat, Adobe has focused considerable effort on its support for 3D CAD standards, specifically in manufacturing. With the release of version 9, it has added emerging 3D AEC (Architecture, Engineering, Construction) and Geospatial formats. Adobe also appears to have settled into a yearly release cycle for new versions of Acrobat, with the last three versions being released from May to July after an extensive open beta program.

New horizons

The Acrobat 9 family consists of Acrobat 9 Standard, Acrobat 9 Professional, and the new Acrobat 9 Professional Extended software. The latter has replaced the Professional 3D branding but still offers the most comprehensive suite of tools for 2D and 3D designers. While the Extended brand harmonises the naming convention with Adobe's popular Photoshop Extended image manipulation tool, dropping the '3D' might be confusing to Engineers and Architects who associate it with Acrobat's CAD version. It may be a marketing ploy, but the news is that Extended is the new CAD flavour.

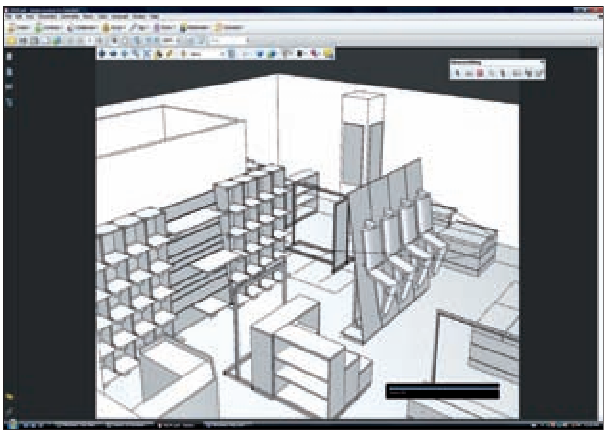
Since Adobe bought Macromedia, the Flash format has managed to work its way into the majority of Adobe products. This time round it is Acrobat's turn to benefit and the addition has really enhanced both the process of creation and the experience of exploring through multi-document PDF. Flash may be considered a web-based technology, but it is actually a powerful visual operating environment in its own right and liberates Acrobat and PDF from very 'static' front ends.



AEC models can now be imported into Acrobat via support for the Industry Foundation Class (IFC) format.

In Acrobat 9, Flash is used to capture and embed video, as well as enhance the delivery and navigation of packaged multiple files within a single PDF. Here, files can be added into a 'portfolio', through a slick Flash interface. Portfolio is the new term for compiled PDF documents and they are really pretty cool.

It is now easy to create a single PDF file that contains all types of documents with the polished Flash front-end page that includes a title page, displayed on opening the PDF. The Flash environment radically improves the experience of wading through a multi-document PDF. Each file can be flicked through as if it were on a carousel (think Apple iPod Touch, or iTunes).



Using the range of shading tools it is quick and easy to build up a number of views and images to send to clients.

The new video feature is great too, as Flash is very efficient at compression. The Video tool lets users import files in a wide range of formats including AVI, MOV, WMV and MPEG, which Acrobat 9 Pro Extended will then automatically convert to Flash FLV. Users simply pull out the selected frame as a poster image.

Another neat trick here is the new capability to pause a video and mark-up individual frames with the Redline tools (texts notes, clouds, post-it notes). As users pass these comments, a list of marked-up frames gets generated for quick access and the author the ability to select sub-sections of video to be viewed by the PDF consumer.

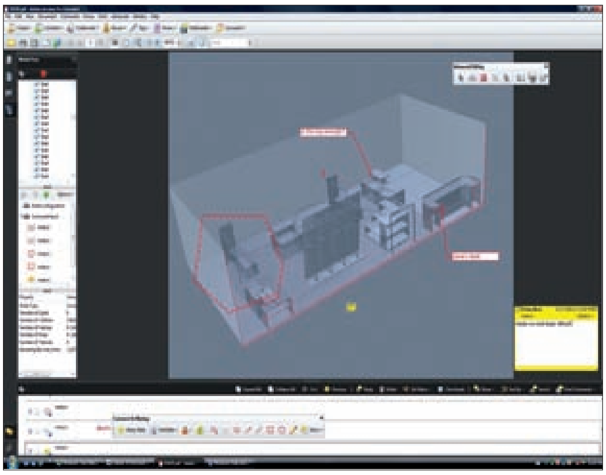
The inclusion of Flash also means that the PDF has become an independent environment, supporting applications written in Flash which can be embedded to PDFs prior to circulation. For instance, users can add a calculator widget, a live web map or a web service. This means users can open a document and use a built-in Flash calculator to work on spreadsheets or engineering calculations, without ever leaving the PDF document. It can be a difficult concept to understand, as it blows away the existing limitations of what can be included in a document: Documents can now include applications.

CAD support

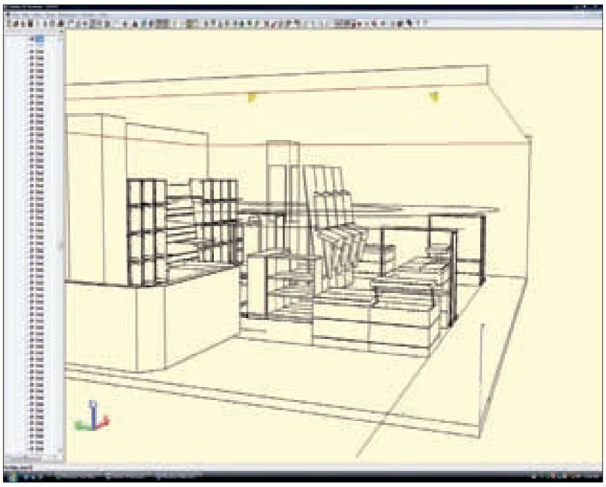
Acrobat's formats have been updated with native support for Autodesk Inventor, B-reps (boundary

representations), STL (a standard for Rapid Prototyping), Systèmes' Catia V5 and Siemens PLM Software's NX formats. This concentration on the high-end CAD and manufacturing formats makes sense as Acrobat's customer base expands into Automotive and Aerospace with clients like car manufacturer Renault.

In the past, Acrobat has catered to AEC with native support for AutoCAD DWG and DXF. Recognising that AEC is gathering pace towards a 3D future, Acrobat 9 now supports Autodesk's Revit and Graphisoft's ArchiCAD modelling systems via IFCs or Industry Foundation Classes, a Building Information Modelling (BIM) interchange format.



Comments and redlines can be added to 3D models and views. These can be navigated by people who are sent the PDF and use the free viewer.



Acrobat Review is the vastly superior application that replaces the 3D Toolkit in Acrobat 9 Professional Extended. Here you can fly through the design, create animations and compare models.

Pricing information

Acrobat 9 Pro Extended, Acrobat 9 Pro and Acrobat 9 Standard for Microsoft Windows, and Acrobat 9 Pro for Mac OS X, are expected to be available by July 2008. Acrobat 9 Pro Extended is expected to be available for £619 (which is a nice price cut), and registered users of qualifying earlier versions of Acrobat can upgrade to Acrobat 9 Pro Extended for £205.

Acrobat 9 Pro is expected to be available for £425, and registered users of qualifying earlier versions of Acrobat can upgrade to Acrobat 9 Pro for £145. Acrobat 9 Standard is expected to be available for £265, and registered users of qualifying earlier versions of Acrobat can upgrade to Acrobat 9 Standard for £85.

For those 3D formats that are not natively supported, Acrobat still includes the '3D print screen capture' capability, which literally grabs the geometry that is in the computer's graphic display system.

Authoring and exploring the imported and captured 3D files was poorly catered for in past Acrobat releases. Adobe licensed Right Hemisphere's 3D Toolkit, which proved to be the most unintuitive application that I have had the misfortune to use in a number of years. So the dropping of that in favour of the introduction of a powerful new tool called Adobe 3D Reviewer is warmly welcomed.

This application came along with Adobe's acquisition of CAD format specialist, TTI, last year. While the interface is nowhere near as slick as Adobe's other Acrobat products, the functionality of Reviewer goes way beyond authoring and enhancement of the 3D models, it also acts as an agnostic 3D CAD viewing and comparison tool, much like Cimmetry's (Oracle's) Autovision.

3D parts created in multiple CAD systems can be easily imported into the same workspace for the creation of and independently sourced 3D assemblies. There are comparative tools to check differences in geometry between CAD revisions, so new geometry added, or old geometry lost can be quickly identified. Measurement and sectioning have been improved and it is easier to export the files as 2D vector or Raster files.

Acrobat now knows where in the world its contents are located, as support for mapping standards are included. It understands geospatial information and can accurately measure kilometres, miles, longitude and latitude. This expands PDF into a whole new vertical area as well as enhancing map data for AEC applications. The move follows both Autodesk and Bentley's addition of geospatial referencing in AutoCAD and MicroStation respectively. We are all increasingly designing in a virtual world.

Shared services

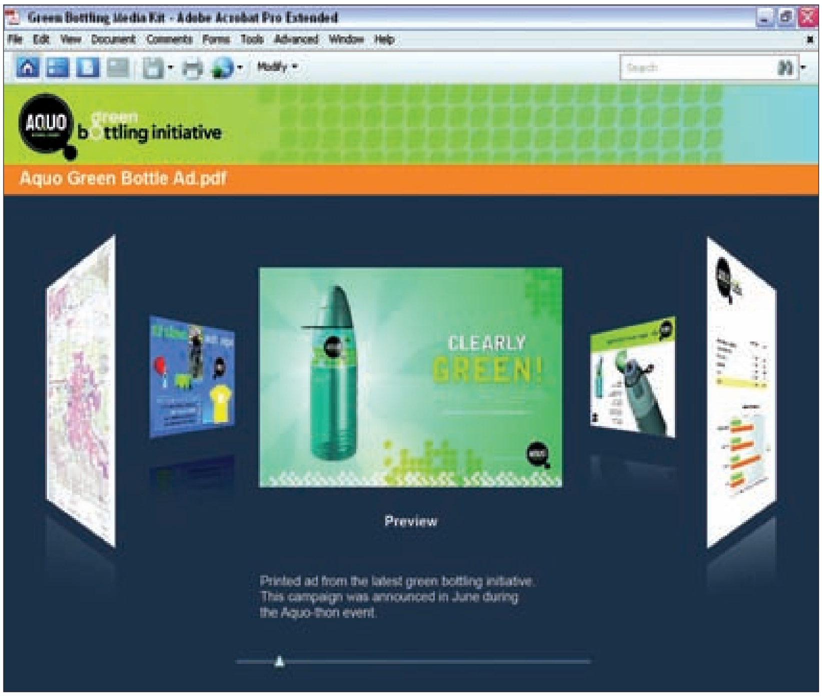
Collaboration and sharing has seen some big leaps too. Acrobat 9 users can access a new web service called Acrobat.com for storing and sharing files. The website is a 'cloud' location and offers both free and paid-for services, such as the new Adobe ConnectNow personal web conferencing feature, which provides desktop sharing, video and voice conferencing, and integrated chat.

Another benefit of Acrobat.com is the opportunity to collaborate with other users while within a PDF document. Using Adobe Reader, other users can join in a review session on a file, with the originator driving the group's navigation through the PDF document in real-time. As Adobe points out, this helps ensure everyone is literally, and figuratively, on the same page.

Acrobat is really good at making digital forms and now it is great at distributing these forms and collating the returns. You may have used web services like www.surveymonkey.com to conduct customer surveys, now you can send PDFs out and let Acrobat gather all the responses and tabulate the results. While it sounds complicated, it is all pretty straightforward using wizard-style dialogues.

This release of Acrobat 9 Professional Extended has really seen the product extend and mature its appeal to designers in both the manufacturing and AEC markets, with additional focus on providing powerful internet-based capabilities for presentations and collaboration. The addition of Flash will also improve the overall experience for PDF creators and receivers. Replacing the 3D Toolkit with something more powerful is welcome but the lack of interface homogeneity needs to be addressed. Our overview is based on the beta version of the software and the final code is expected to arrive in July.

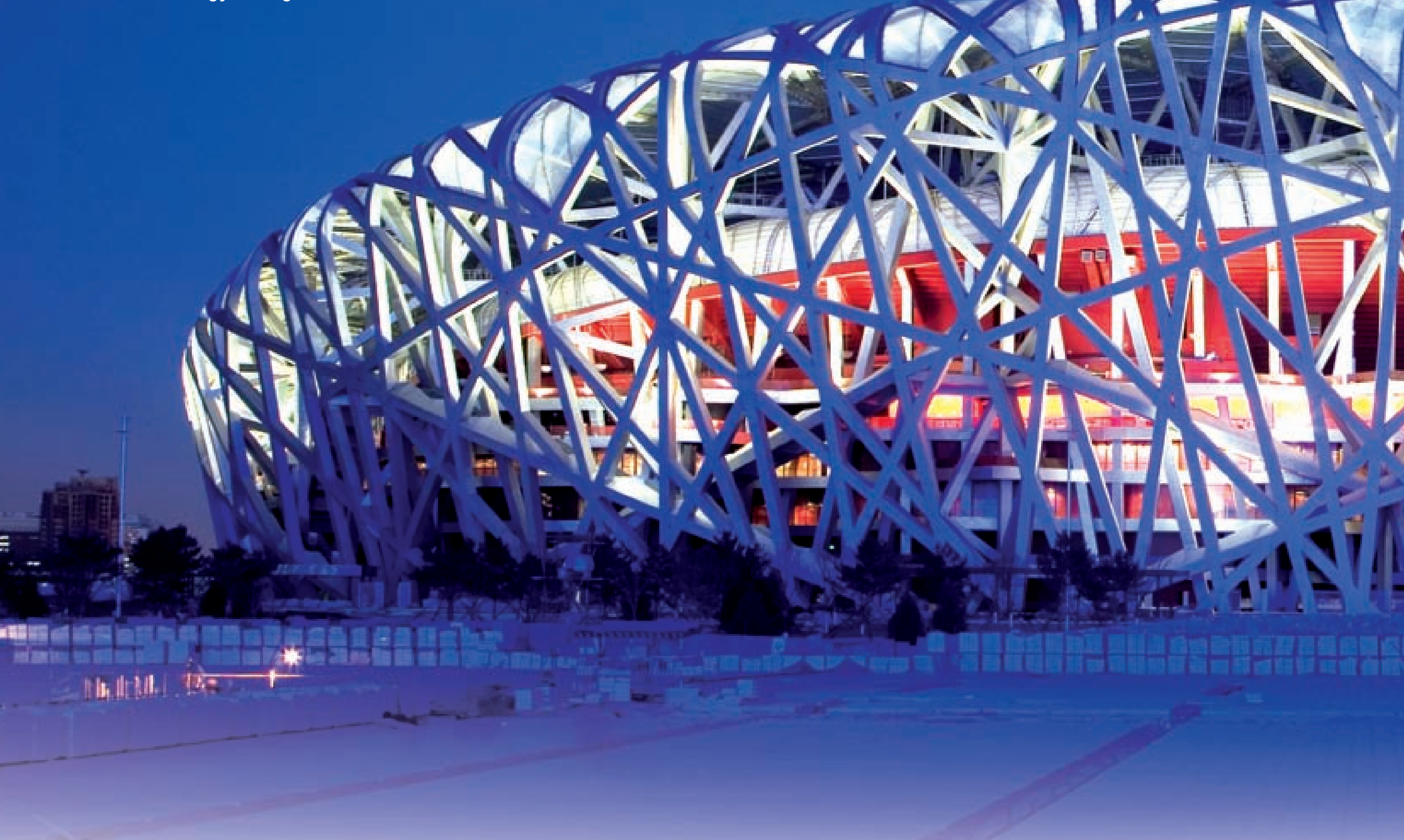
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What's possible with the new Portfolio capability: PDFs that contain multiple documents can be scanned through on a carousel in a customised presentation-quality environment.

Pushing the limits in stadium design

Now considered an urban essential, increasingly sophisticated sporting arenas benefit from Dassault Systèmes' Catia design-to-build technology that generates 3D models for a better outcome.



Above: ***The Beijing Olympics Stadium represents the peak of innovative and complex design. It is built from more than 40,000 tonnes of steel enclosing 90,000 seats. The apparently random design is in fact very regular, but gives the appearance of a natural form hence its nickname – the bird's nest.***

Hundreds of new sports facilities are being built right now across the world. These will host a range of events from The Olympics Games and Premier League football to horse and motor racing, tennis, gymnastics and swimming, as well as multi-purpose venues that enhance national, local and community sporting activities.

Some of the best of these facilities, including the 2008 Beijing Olympics Stadium, are developed using Catia advanced 3D model-based design-to-manufacture solutions from Dassault Systémes and with the Gehry Technologies' Digital Project software platform. In preparation for both Beijing 2008 and London's 2012 Olympics, Catia is used to ensure that complex structures for the Games and their many associated activities are delivered on time, on budget and to the right specifications.

The development of multi-purpose sports stadia represents one of the most difficult building problems, since they have to satisfy the needs of so many stakeholders. New bowl-shaped stadia housing up to 90,000 spectators have become symbols and icons of their locations that have changed from 'bad neighbour' buildings, formerly sited out of town, disconnected from transport infrastructure and surrounded by huge car parks — to city centre must haves.

The importance of new sports facilities in regenerating cities was stressed by the former Mayor of London Ken Livingstone, who recently said: "The London Olympic Games in 2012 will be the greatest sporting spectacle the world has ever seen — as well as transforming the Lower Lea Valley and creating a lasting legacy of cutting-edge sporting venues for the capital and the nation."

Olympic glory

The foremost company working in this sector is Arup Sport, whose work includes the 2008 Beijing Olympics Stadium, The London Olympics Aquatic Complex, the stunning Valencia Stadium, and new world-class stadia for Ukraine and the Middle East.

Arup Sport Senior Structural Engineer, Kate McDougall, spoke of her work and the use of Catia 3D-based model technology. "The stadia and sports facilities that Arup Sport is working on benefit from Dassault Systémes' 3D modelling because of the functionality and flexibility that this methodology provides. Our work covers architectural design services, structural, mechanical and fire engineering as well as many other specialist technical services. Using 3D Catia models, the information that we need is easy to access, update and integrate across the internal and external supply chains that we operate within."

Kate added: "Stadia are all unique and they always incorporate complex geometry. Co-ordinating their design, planning and construction involves making many changes and updates throughout the project lifecycle. This process is enhanced and facilitated through the use of 3D digital models. The software allows us to save costs by developing a route to manufacture early in the project and also by allowing us to make use of standard components to improve quality and make financial savings. The Catia 3D-based model methodology also makes checking efficient, easy and quick since complex geometry is modelled in three dimensions."

The spectacular Beijing Olympics Stadium is the most high-profile sports facility in the world and represents the current peak of innovative and complex stadium design. The stadium is built from more than 40,000 tonnes of steel enclosing 90,000 seats. The apparently random design is in fact very regular, but gives the appearance of a natural form

"Stadia are all unique and they always incorporate complex geometry. Co-ordinating their design, planning and construction involves making many changes and updates throughout the project lifecycle. This process is enhanced and facilitated through the use of 3D digital models."
Arup Sport Senior Structural Engineer, Kate McDougall

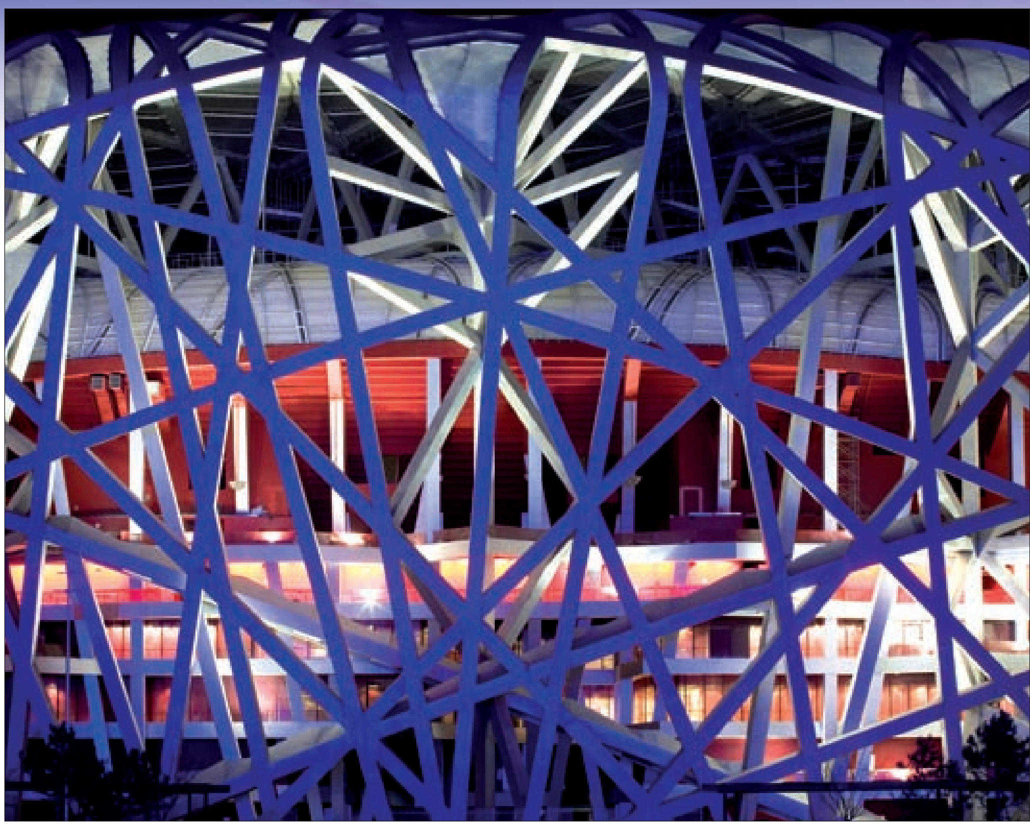


hence its nickname – the bird's nest. The geometry of the steelwork was defined using Catia to achieve the required absolute accuracy that both the design and its commissioners demanded. The structure has been engineered to accommodate wind and other loadings to which the building is subject.

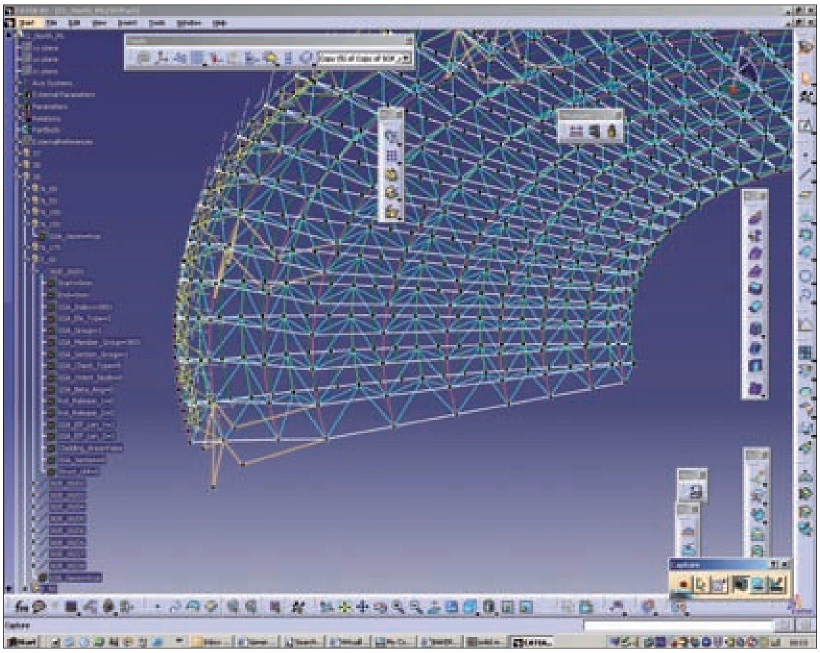
Model data was passed to subcontractors for component fabrication, assembly and erection with Catia data being used not only to produce the work but also to check build veracity. The building's exterior design looks much more complex than it actually is, and is constructed from flat plate steel formed into box sections (with increased thickness to cater for variable high stress areas of the structure). There is a very clear pattern to the construction, which is subtly hidden by a second façade. Using Bill of Materials optimisation capability leads to more standard parts being developed and brought into the design of the impressive façade. Due to its geometry, the building only has two-fold rotational symmetry – there are only two of any joint type or element on the project.

The building had to be radically re-designed at a late stage to lower cost. This reduced the steel content by 20 percent and necessitated considerable alteration to the building in many areas. The use of a 3D central

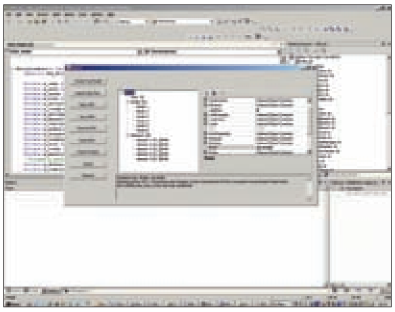
Below: *The geometry of the steelwork for the Beijing Olympic Stadium was defined using Catia to achieve the required absolute accuracy that both the design and its commissioners demanded.*







Above: ***Shakhtar Stadium is a football stadium in Donetsk, Ukraine, designed by Arup Sport using 3D Catia models. It is currently under construction.***



Above left and left: ***For the Shakhtar Stadium Arup Sport used a visual basic link from Catia to generate its analysis models.***

model made this work much quicker than it would have been by other means and allowed the building to be brought in on time and within the revised budget.

Arup's Project Director Michael Kwok was recently quoted as saying that the Beijing National Stadium has introduced a new kind of structure to the world and that its successful completion showed the role engineers can play in defining what is possible in architecture.

Team effort

Sports facilities are now considered part of the urban fabric that has to be integrated into the existing and future city context. The use of Catia to help design sports facilities has the great advantage that, in using a core 3D model, the design can easily be changed to meet the often conflicting needs of those involved in planning, operating, financing, fabricating and construction as well as visiting, using and broadcasting from the facilities.

Having produced conceptual designs for a stadium using Catia 3D modelling software, and taken into account the different needs of all stakeholders, the model can be developed and made available to all concerned in a format that suits their needs and interactivity tools. Each participant can access the model drawing from it and the data that they need to conduct their work most efficiently. This can range from simple viewing with pan, zoom, rotate and mark-up facilities, to full interaction and, for example, direct NC machine programming to produce building components, fabrications and work instructions. The digital model has many uses as a central repository for ideas and the designs and methods that result from them.

Plan to win

Planning is of very high value in the development, construction and lifecycle operation of sports facilities. Buildings must have flexible usage and, since their life may be more than 100 years, the needs of its users and other stakeholders will inevitably change. These changes can be best understood and addressed using a 3D digital model, which can be iterated easily to accommodate changes of use and function.

Sports stadia are increasingly being built as part of a broader visitor experience. A new football stadium in Porto, Portugal for example is planned to contain a shopping mall, a hotel, and a cinema complex along with deep underground car parks. It will integrate with an enhanced transport infrastructure planned for the city and offer sports fans unprecedented levels of luxury. By making this available, the stadium will attract visitors at times other than major events to provide a continuous revenue stream.

This sort of project was described by Andrew Watts MD of Newtecnic, a firm of architects specialising in very advanced building façades — important for producing strong visual impact along with structural functionalities. He said: "The way modern buildings are designed has changed to accommodate ideas about how usage will alter over time. Consequently, spaces are much more flexible and non-specific. This means that the mechanical services of a building will change along with its usage. A 3D building model is the ideal repository for the design because it allows changes to be made over time, effectively extending the design period over the life of the building."

He continued: "The process of making buildings is becoming more complex and the tools, such as Catia, are developing along with that process. The ability to change a building while retaining the integrity of the design vision allows us not only to design faster and more easily but to show interested parties how the design is developing in ways that they can understand and make best use of."

Rules of the game

Because Newtecnic's façade systems have both structural and decorative functionality and Newtecnic sees designs through to construction, it has evolved a complete façade manufacturing methodology. To handle this level of involvement, Newtecnic deploys Catia technology — the same software that is used by major automotive and aerospace OEM companies to design and build the world's most advanced engineered products.

Andrew Watts explained: "The ability to turn conceptual designs into buildable structures while retaining the precision of the original creative intention requires the equally precise methodology that this software provides. This tool is liberating because it allows designers to iterate the design within a set of flexible governing rules. At Newtecnic, this methodology liberates us by allowing considerable creativity within the rigor of strict rule-based engineering discipline."

Green medal

Environmental impact is a major theme of modern buildings, and their public nature means that large stadia and other sporting facilities must be exemplars of green credentials. Catia is being used in many buildings to design, refine and manufacture air circulation systems that reduce reliance on air-conditioning by using passive or mixed-mode ventilation with its greatly decreased

energy requirements. Integration with Dassault Systémes' Simulia finite element and computational fluid dynamic analysis software allows designers to simulate airflows within structures improving comfort levels for sportspeople and audiences alike.

Catia has been used to design many roof systems for sports stadia. These are becoming important showpieces in themselves with their dramatic operation and engineering ingenuity. The complexity of these structures that often include intricate but large-scale moving parts is ideal for development using Catia which, with its kinematic capability is able to show a simulation of the moving roof and indicate potential clashes or other problems. By deploying Catia in this situation it is possible to solve all potential problems through analysis and refine the design digitally before any physical manufacturing commences.

Kate McDougall, of Arup Sport, added: "Roofs have to clear certain envelopes and must also operate with maximum efficiency. Developing optimum geometry and sections is made easier with Catia because it enables the input of parameters that have an affect on the design, and allows automation of certain aspects in the design process."

Importantly this methodology also enables parameters held on spreadsheets to drive designs in Catia. This often results in innovative and novel solutions that will comply with functional requirements — leading to better and more advanced buildings.

The physical making of the building (once the design is finalised as a 3D model) can be carried out by subcontractors under the guidance and control of planners and project managers who use the central model as a data repository accessible by all parties collaborating to maximum mutual benefit.

The long run

Multiple stakeholder interaction with 3D models was described by architects at Allies and Morrison. The firm was recently involved, with architects HOK, in The Emirates stadium and development for Arsenal FC. Despite being a complex multi-purpose facility including restaurants, bars, a future-proof flexible IT infrastructure in an iconic form, on a historic site that offers enhanced environmental benefit to its central London location, the stadium and associated development was finished ahead of time and below budget.

Allies and Morrison remarked that the ability of Catia to integrate with climate and environmental data, allows their designers to model not just the structure of a building, but also the weather and light conditions to which it will be subjected. By taking into account this level of detail the eventual value of the building will be higher since the additional comfort that it proves will make it more desirable and popular.

The team at Allies and Morrison found that design intent is captured in the 3D model as a series of rules that the software maintains and applies throughout the design process. This means that conceptual frameworks stay intact throughout the many changes that the design is subjected to, and that all the while, development targets are retained and optimised.



Taste of victory

Zaha Hadid Architects has been commissioned with delivering the spectacular swimming complex for the London Olympics. Partner, Patrik Schumacher, a champion and user of 3D modelling software recently said: "Productivity, creativity and elegance are available from Digital Project and the Dassault Systémes software."

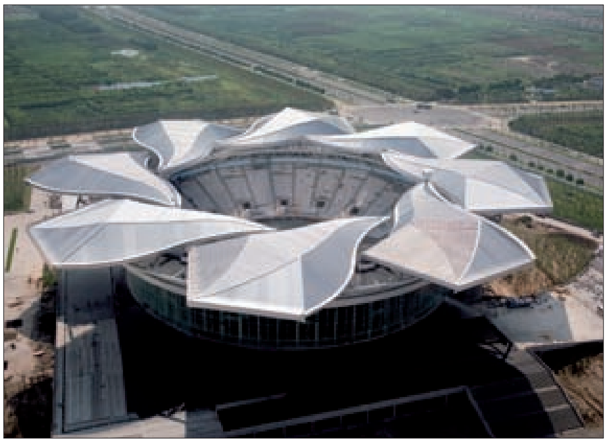
Ken Livingstone recently commended the complex when he said: "Zaha Hadid's exceptional winning design gives a taste of just what we can offer and makes London's bid to host the Games even more compelling."

Geoff Haines, Managing Director of Desktop Engineering, the company that supplies and supports Digital Project and Dassault Systémes' 3D modelling software at many architects and engineering companies including Zaha Hadid, Arup, SOM and Allies and Morrison said: "Dassault Systemes' Catia brings architects, sports facility developers and the AEC industry the proven benefits of large-scale design and manufacture software. The Catia-based Building Information Model (BIM) is a complete set of data that includes 3D design and manufacturing information, as well as associated rules, methods and knowledge that govern all aspects of a building or development."

Mind games

Lord Sebastian Coe, winner of the Olympic 1,500m gold medal in 1980 and Chairman of the London Organising Committee for the Olympic Games (the organisation in charge of overseeing the development of the Olympic Games), is someone who understands the significance of well-executed design in sports facilities. He recently spoke at the opening of a new training facility: "I know just how important that extra hundredth of a second can be and these facilities will enable athletes to develop and hone their technique allowing them to be at the top of their game."

Great athletes need great stadia. Sports Psychologist Bogdan Woolf of Institute Lacan claimed: "The psychological effect of new stadia on the sports person is profound. For example, a recent study found that referees award 15 percent favouritism to home sides that have adapted their cheering to suit, and maximally exploit the acoustics of the setting. Using Catia, it is possible to incorporate these subtle but important influences in an aim to create the perfect environment for players and fans."



Complex moving roof structures of The Qi Zhong Tennis Centre in Shanghai, by the Environment Design Institute (EDI) of Japan. *Image by John Gollings.*

Perfect pitch

Another example of advanced pre-build simulation is found in sunlight modelling that shows how the interior environment will react with the forces of nature. This is particularly important in order to maintenance both natural and artificial playing surfaces. In one celebrated example the constantly shaded grass-playing surface of a pitch in Japan is placed on a rolling platform and swapped with one that has the benefit of natural sunlight outside the stadium. This ingenious solution was developed using 3D modelling software in conjunction with sunlight calendar data to produce optimised playing surfaces.

It is well known that great facilities enhance sports to produce better outcomes. Across the world Catia users are developing and building ever-more advanced venues that help human beings excel at what they do best.

For further information:

Dassault Systemes – **www.3ds.com**
Desktop Engineering – **www.dte.co.uk.**
Zaha Hadid – **www.zaha-hadid.com**
Allies and Morrison — **www.alliesandmorrison.co.uk**
Newtecnic — **www.newtecnic.com**
Arup Sport — **www.arup.com**



Virtual construction

John Robertson Architects has been committed to Building Information Modelling (BIM) for the last 11 years. It recently took the next step, moving beyond model-based architecture towards full building lifecycle management.

John Robertson Architects (JRA) is a 50-strong London-based practice and one of only a small number of companies in the UK using BIM on all its projects. However, it wanted to take the next step, moving beyond model-based architecture towards full building lifecycle management, where design, construction and facilities management utilise the same, continually evolving, building model. Technology advances have made extending 3D design into 5D construction a practical reality and with a visionary developer client in TEAM Ltd, JRA has now started to work in a 5D environment.

This may sound unlikely but the fourth and fifth dimensions on a building project are real, and show the cost and time to build. Put simply, imagine a 3D animation simulating what will be the on site construction process for this building. This simulation also includes a timeline to show precisely the state of construction at any point and also a cost accumulator that registers the corresponding cash requirements at any point.

Using TEAM's Parmiter Street development as a pilot project, JRA created a 3D virtual model of the extensive £25 million residential/commercial development that includes 105 three-, four- and five-bed homes, as well as accommodation for 55 students in medium rise blocks around two courtyards.

For the Parmiter Street Project JRA built a 3D model using ArchiCAD, and then used Vico's Software's Virtual Construction products to prepare accurate cost schedules and utilise highly visual on-site planning and control.

JRA built the 3D model using ArchiCAD — Graphisoft's BIM software — which also provides the foundation for the Virtual Construction products from Vico Software. By being able to flow the design model into Virtual Construction, it is now possible to prepare very accurate cost schedules, which can be quickly revised if required, combined with highly visual and flexible on-site planning and control. The on-site planning and control uses a technique especially designed for construction projects – Line of Balance – which has been proved to be far more effective than traditional Gantt charts. Virtual Construction is entirely dependent upon an initial design being prepared using BIM and JRA's experience in model-based architecture was pivotal to the success of the 5D pilot project.

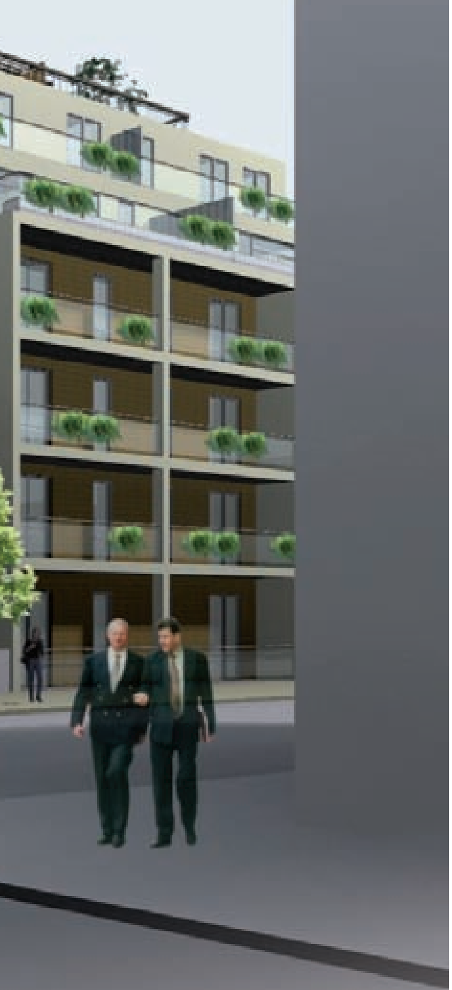
How 5D works

Virtual Construction helps ensure that the data that architects produce is useable by everyone, from structural and building services engineers to the project manager, cost consultants, the client, and ultimately the building operator. The virtual models are viewed in 3D but any 2D representation can be easily created.

Clash detection saves large amounts of time by checking the accuracy and correct alignment of details; constructability models identify the sequence of construction; precise costing assists the quantity surveyor; and, the software's planning and scheduling capabilities are indispensable to the project management team. The software does this by utilising the intelligence in the BIM database and extending this with how materials, labour and plant are applied to the construction of this particular design — from initial ground works to final fit-out.

This construction information, or 'recipe', is added to the BIM database as each new build process is planned. Then, as Virtual Construction is used on subsequent projects, the recipes can be re-used and adjustments can be made, for instance to provide more precise costs or construction times and so the information refinement goes on. The 3D design







becomes quicker to manage into a 5D environment with every 'recipe' refinement and this enables the 5D software to produce extremely accurate costing and highly effective project planning and management.

Virtual Construction enables everyone to work in the same virtual environment. By providing a platform in which all disciplines can operate it brings a level of transparency to the construction process not previously seen. Designs can be checked and changed in the model; potential problems with materials or resources can be highlighted and attended to before work has started on site; and cost implications are apparent long before it is too late to make amendments.

"Three and now five dimensional modelling is bringing about a change in the working methodology of the architect," says JRA Director Ben Wallbank. "We have to move away from 2D design and become proficient in these new techniques because clients and main contractors want to use them. They see that these advances can make the construction process more efficient and if architects don't grasp this opportunity to control the design process someone else will."

JRA's Parmiter Street project has received planning permission and now the model will be developed further to produce a detailed design for construction. The 'recipes' have been applied to the design model and these will be re-used as JRA implements TEAM's newest project, a regeneration scheme in the East End of London. This mixed use development with over 600 residential units uses many of the lessons learned and data input from the previous project. Wallbank says, "Initially there was quite a lot of work to input the 'recipe' data at the start of the Parmiter Street project but that has now fed through for use on this next development. Work that took one and a half months for the Parmiter Street project is instantaneous on the new scheme because the software has remembered what we need and can apply it straight away."

For the architect, 5D design represents a real chance to claw back some of the control lost to design and build contracts, panelised system manufacturers, and even Ikea with its flat-pack homes. Virtual Construction gives the surety of cost and quality that these less design-friendly solutions offer, while allowing architects the freedom to design inspiring buildings. It also automates some of the time consuming elements of the design process, such as cross checking consultants' drawings, bringing more speed and efficiency to the architect's work.

"We now 3D model all of our new projects," says Wallbank. "With 5D, we are looking at a new era in the construction industry. We will provide a complete solution for the client, where projects are more accurately designed and tighter controlled throughout. If you can offer that you have a real edge over your competitors."

Parmiter Street is a £25 million residential/commercial development that includes 105 three-, four- and five-bed homes, as well as accommodation for 55 students in medium rise blocks around two courtyards.

TEAM will also benefit from the use of 5D design in multiple ways. Its design and construction team is able to keep constant track of project costs and programme implications. Problems are being designed out before work starts on site and the whole pre-construction process is running more smoothly and more efficiently. In the long run, TEAM also plans to use the BIM model as a facilities management tool, to check and update the environmental operation of the building. ***www.graphisoft.co.uk***

"With 5D, we are looking at a new era in the construction industry. We will provide a complete solution for the client, where projects are more accurately designed and tighter controlled throughout."
Ben Wallbank, ***JRA Director***



Staying on track

The East London Line is part of the London Underground Network and has been operating in various guises since 1869. The line features the world's first underwater tunnel, which was relined and refurbished in the mid-1990s in anticipation of the East London Line upgrade.

The $2.75 billion East London Line Project will connect Highbury and Islington Station on the North London Line with the Network Rail infrastructure in South London. The eight mile project is expected to trigger economic revitalisation in areas that are now poorly served by rail. Mott MacDonald, technical advisor to Transport for London on the East London Line Project, conducted the preliminary design for the project.

Like the trains that will eventually run along its tracks, a railway improvement project is governed by exacting timetables. Phase 1 of the project encompasses the infrastructure to extend the railway north to Dalston Junction Station along with a connection to the Network Rail infrastructure at New Cross Gate. This phase is scheduled for completion in 2010, in time for the 2012 Olympics in London.

Phase 1 is divided into three sections: northern, central, and southern. Each section presents distinct engineering challenges. For instance, the northern extension runs 2.5 miles; 2 miles of which will use structures abandoned in the 1980s. The central section is 2.3 miles in length, using the tunnels of the existing East London Line, and the southern extension is 2.2 miles in length.

The northern extension route from Dalston south to Shoreditch will use the Victorian brick arch Kingsland Viaduct, which was abandoned in the 1980s. From there, the new line will pass over the former Bishopsgate Goods Yard on a new concrete viaduct before ramping down to connect into the existing East London Line at Valance Road. From the Valance Road portal, the railway will use existing East London Line tunnels.

The track and the rest of the railway infrastructure, however, will be replaced throughout the length of the central section, and the stations will be remodelled. A new facility at New Cross Gate will handle storage, maintenance and cleaning for the fleet of trains. The facility will provide room to house 20 four-car units and service four units at a time from either of the East or North London Lines.

Four stations will be built on the northern extension to supplement the six at the central section and the two at the end of the southern extension. All told, the project requires 10 new major structures and two dozen minor structures. The central section includes 36 new point ends along the route with 16 more within the storage facility. Additionally, more than 140 signals will be installed along the length of the railway.

Getting more from the model

In the past, signal positioning on a new railway was a matter of experience on the part of the designers involved. Today, there are solutions available that enable designers to build on that experience and eliminate possible risks.

"Because roughly half of the infrastructure for the East London Line Project does not yet exist, Mott MacDonald used visualisation to resolve design issues and move forward into detail design with increased confidence in the validity of the designs. The firm built a 3D model of the railway using MicroStation based on topographical surveys and current infrastructure designs," explains Mark Eaden, principal engineer at Mott MacDonald.

Mike Stubbs, head of engineering on the East London Line Project adds, "Signal sighting ensures physical obstructions cannot impede the sight lines to railway signals, and this can normally only be done

Mott MacDonald used visualisation to resolve design issues and move forward into detail design with increased confidence in the validity of the designs.





effectively on site.

"The use of virtual reality simulations has enabled the signal sighting committee, as required by Network Rail standards, to assess the physical constraints and obstructions well before the railway infrastructure has been constructed, thus significantly reducing the risk of having to change things when on site," he says.

About 80 signals will be positioned on existing infrastructure. Conservative estimates assigned a cost of £7,000 to £8,300 per shift spent on signal sighting, for a total project cost of £0.6 million.

Mott MacDonald estimated that, as with most urban railways, the sighting committee could go out only at night and resolve signal sighting issues at a rate of one signal per shift on average, meaning that it would take as long as six months to complete the signal sighting, which was the total time allocated to design the signaling system.

3D simulations have enabled the signal sighting committee to assess physical constraints and obstructions well before construction.

Over the six-month period, however, Mott MacDonald spent only £135,000 on the 3D modelling process and sighting committee meetings. The eight miles of railway required more than 260 discrete models, including all aspects of the railway infrastructure that affects the signal sighting process. Visualisations were initially based on designs in development and then modified as the design progressed, which, of course, had to be completed quickly to confirm design decisions.

The firm used an assortment of Bentley products, including ProjectWise, ProjectWise Navigator, Bentley Rail Track, and Bentley CloudWorx. "The modelling process highlighted the complexities of threading a 21st century railway through 19th century infrastructure," said Mark Eaden. "The alignment design broke many of the rules in the book, and the signaling scheme now employs some decidedly inventive solutions."



The New Cross Gate facility, for example, underwent several revisions during the project design. Initially, the plan was to house 10 to 12 four-car units. But when preliminary design started, that requirement had increased to 20 units, and included light maintenance and heavy cleaning facilities. Further project enhancements required Mott MacDonald to include a heavy maintenance facility for four train units, and a wheel-lathe and heavy-cleaning building as well.

Bentley solutions enabled the team to make these changes quickly, and helped guide design decisions. The signal sighting process highlighted a critical flaw in the operability of the storage facility, which the Mott MacDonald team resolved quickly and efficiently. "The use of Bentley software in the signal sighting activity has enabled the project team to significantly reduce any chance that the design would need to be changed during construction," said Mike Stubbs.

The original request for an initial signal sighting assessment resulted in 18 months of continuous work for the Mott MacDonald modelling team, which included three engineering technicians, an operations professional, and an engineering project manager. The firm is developing proposals to continue the process through the detailed design phase of the East London Line Project.

"The initial phases of signal sighting yielded a measurable savings in time and costs, but these direct savings pale in comparison with the potential financial and schedule savings associated with the risks of errors at the detail design and implementation stages," said Mark Eaden.

During detail design, for example, a change in position of a single signal could result in rework ranging from £21,000 to £53,000, not to mention several weeks of delay in the schedule. But if that same error arose in the procurement stage of the project, the costs and schedule implications would increase by a factor of 10.

From the start Mott MacDonald intended the 3D model to deliver more value than simply assessing signal sighting. In fact, the model is now used to inform design decisions ranging from passenger evacuation analysis to interdisciplinary checks. The modeling process is designed to leave as many avenues as possible open to exploration. For instance, the savings from using the 3D models to train drivers is estimated to be over £3 million.

www.bentley.com

Project details

East London Line Project

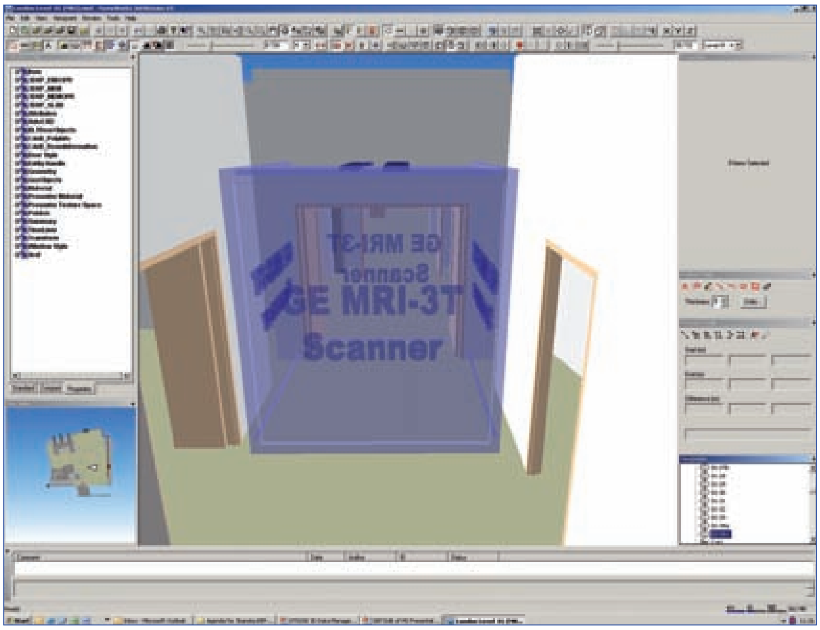
Mott MacDonald Ltd

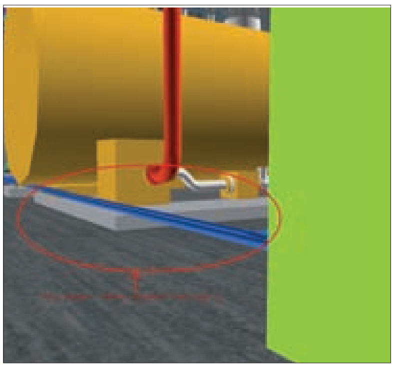
Project Objective

Develop a 3D model to accelerate the threading of a 21st century railway through 19th century infrastructure.

Visualising the project plan

With the help of Autodesk's NavisWorks, project contractor Skanska took on major modernisation at two London hospitals and was able to simulate how architecture, structure and building services would come together on site.





Top: *Skanska used NavisWorks to 'walk the delvery route for bulky equipment such as this MRI scanner and identify any potential problems .*

Bottom: *NavisWorks helped ensure there was clear and safe access for future maintenance and operation.*

Rebuilding and refurbishing any major building is always a complex task with many contractors and services to be managed. But when the building is a hospital, built in Victorian times and now ready to be brought into the 21st century, the complexities multiply.

That is the task facing Skanska, the main contractor to Barts and The London NHS Trust as they modernise both their major sites: Barts in the City and the Royal London Hospital in Whitechapel. The trust is committing around one billion pounds to the project, due for completion by 2015. With stakes that high, Skanska needs to keep the project firmly on track.

The company has an excellent record in delivering major building works. It was responsible for 30 St Mary Axe in the City of London, better known as the Swiss Re Building or The Gherkin. To help co-ordinate sub-contractors and the installation of plant and building modules, Skanska turned to the JetStream software package from NavisWorks, now part of the Autodesk family.

"The software combines designs from different 3D packages into a single model," explains David Grieve of Autodesk. "With support for around 50 different file formats we can bring virtually any project together into one 3D model which the project management team can use to review the design and progress on site.

"You can review the design without the need to understand CAD, and use that to see how elements fit together," he continues. "It is a four-dimensional package, with main contractors using it to build a timeline of processes. Some will even put up a time lapse camera and compare it with the timeline in NavisWorks."

David Throssell, co-ordination specialist at Skanska for the Barts and The London project, concurs. "We are now established users of the software to animate how architecture, structure and services will fit together on a project plan. We are now finding new uses for it, and it is clear that we can demonstrate real savings in cost and improve the robustness of our timescales."

Throssell quotes a simple example for the Royal London site. The refurbished building needed twelve electrical sub-stations, installed in different places within the building. As project managers, Skanska needed to know that each could be physically delivered to its plant room as well as installed safely when it got there.

"One option would be to run factory tests then disassemble the sub-stations, move them into place in parts, then re-assemble and retest them," Throssell explains. "We did not want to do that, partly because of the cost – around £10,000 for each of the 12 sub-stations – and partly because of the time it would take on site.

"Using NavisWorks we could 'walk' the delivery route for each unit, and identify where there were problems," he continues. "It allows us to specify larger doorways where these would be a problem, and delay finishing some corridor walls, which would otherwise have been too narrow. Thanks to the NavisWorks model we can identify every installation problem and plan them out, making for a smoother job."

The same planning benefits are being applied to large pieces of plant, service modules and other equipment. Using the timeline functionality allows Skanska to make the best use of resources, for instance planning to build partition walls as soon as all the large modules have been installed.

But what marks a hospital out as an even more demanding case is the requirement to install highly sophisticated diagnostic systems such as MRI scanners and linear accelerators. These, too, are large pieces of equipment which need to be delivered to their final locations as finished assemblies. Unlike much of the standard building plant, though, they can only be delivered to a finished, clean and dust-free environment.

"An MRI scanner is a big piece of machinery that needs to be delivered late in the construction process, preferably after the walls have gone up," says Skanska's David Throssell. "Demolishing walls on site to get machinery around corners represents a cost and a time over-run, which we need to avoid.

"With the complete 3D model in NavisWorks we can quickly create the MRI scanner in its packaging and move it through the virtual world to its final position. In turn that means we can make changes to the design – raising doors or widening corridors – to make it work."

MRI scanners and the various other large items of specialist equipment required in a state-of-the-art hospital are expensive as well as highly functional, and so the Trust had a separate procurement process for each to ensure they got the best deal in terms of performance and cost. Different manufacturers' offerings for each application would, of course, be in their own housings, sometimes differing widely in size. David Throssell and his team at Skanska needed to be sure that the delivery route was clear whichever supplier of machine was selected.

"We use NavisWorks for spatial co-ordination between disciplines, but we are taking it much further," he says. "We use it to see what we can build before we move plant in, and we use it to see that there is good, clear and safe access for future maintenance and operation. That is what NavisWorks is good at – giving us a complete view of our project in a virtual world." **www.autodesk.com**

AutoCAD Map 3D helps bridge the data divide at Rushmoor Borough Council

Good decision-making depends on everyone working with the best data possible. Rushmoor Borough Council, south-west of London, has done just that by using AutoCAD Map to bring together its design and geographic information.

Access to spatial information is one of the most powerful tools available to town planners, utilities and government. In Rushmoor it is a vital, day to day part of the working of the authority, from those responsible for the upkeep of the council's public buildings, to traffic planners and building control. With around 250 users requiring access to spatial data from several different mapping systems, the call was for a simple, fast way of bringing them together on a single set of information without limiting their ability to carry out their individual roles.

Because of the way that geographical systems had grown within the authority there were a number of different, discrete systems. ESRI ArcSDE was a key part of the authority's strategy, but other parts of the organisation used other software, including AutoCAD Civil. It meant that data could not readily be swapped between departments, and developments in one area need not necessarily be updated in the data sets of other departments

"We hold around 400 active spatial data sets," explained Richard Greaney, GIS officer for Rushmoor Borough Council. "We wanted to move to a position where every user could connect to this data, confident they were working with the most accurate, up to date spatial information we possess."

It was Autodesk that delivered the solution. AutoCAD Map 3D is a powerful mapping solution in its own right, but it also provides a bridge between CAD and geographic information. By conforming where possible to the evolving Open Geospatial Consortium (OGC) standards it provides a simple and efficient way to share information dynamically, allowing each user to work with the tools that suit them best.

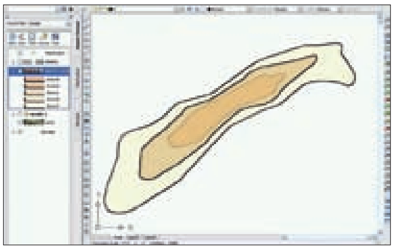
In practice, it means that AutoCAD and ESRI users at Rushmoor Borough Council now share a common data set. Each user maintains access to their preferred tools and way of working, but now they are all working with the same single map information, based on the OS MasterMap for the area.

"It was important that we added the new functionality and data into the existing way each user worked," Richard emphasised. "The great success of the Autodesk route is that everyone is now using exactly the same system they were before, but with added functionality."

> **"It was a lot easier than we expected to achieve connectivity, and already we are seeing increased efficiency for our users andsavings in data management time."**
>
> **Richard Greaney,** ***GIS officer for Rushmoor Borough Council.***

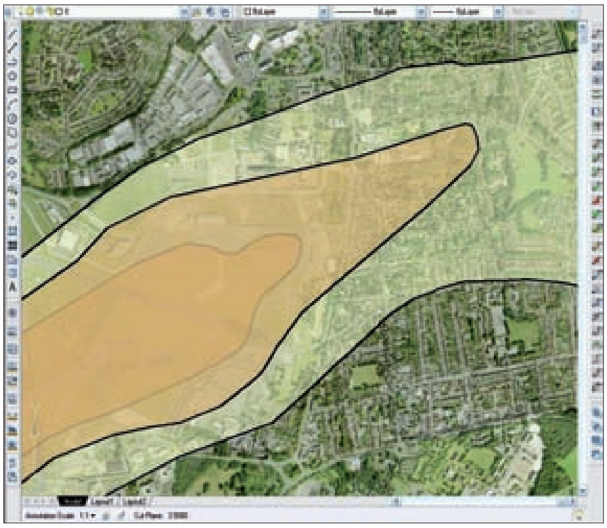


AutoCAD Map 3D is a powerful mapping solution and provides a bridge between CAD and geographic information.



How each officer uses the data depends, of course, on the task at hand.

AutoCAD and ESRI users at Rushmoor Borough Council now share a common data set.



Simple rollout

This massive benefit to users was delivered without any major upheaval. "It was simply a matter of establishing the correct connection to the main GIS datastore, then rolling them out across all the CAD workstations in the council," Richard explained. "We took the opportunity to upgrade to AutoCAD Map 3D 2008 at the same time, and the whole rollout went surprisingly smoothly. To access the new, unified data set it is just like opening a folder."

How each officer uses the data depends, of course, on the task at hand. The underlying OS MasterMap can be combined with aerial photography, and then the appropriate GIS data added on further layers. That data might be noise contours or monitoring data for environmental health, or it could be road markings or planned new building access for the highways department. CAD and ESRI data work seamlessly together.

"The really key point is that everyone is looking at the same information," said Richard Greaney. "This goes a long way to eliminating errors. It is also a big efficiency saving in GIS management: keeping multiple systems up to date meant multiple data loads. Now we just update once – everyone looks at the same central data.

"It has also boosted collaboration," he said. "Previously CAD users – building control, estates and traffic – were isolated from GIS users. Now they are part of the same user group, and we are actively encouraging them to promote the data they are creating to other users, particularly as they get used to the powerful way that GIS can help them."

Implementing this new connectivity, using Autodesk AutoCAD Map as the unifying element to bridge systems, has proved to be a simple yet immensely valuable step for Rushmoor Borough Council. "It was generally a trouble-free process – it felt like a natural progression from where we were," Richard said. "It was a lot easier than we expected to achieve connectivity, and already we are seeing increased efficiency for our users and savings in data management time.

"This really is just the start for our potential spatial/CAD usage. And most important of all, the users are happy with the set-up – they see this new approach as a positive step."

www.autodesk.com

Kicking goals

iKix was India's first service bureau chain for architectural 3D printing. By encouraging model making at all stages of the design process, is helping take rapid prototyping technology to the next level and using it as a project management tool.

In his two decades in the computer-aided design industry, R. 'Partha' Parthasarathy's first question to clients has always been: "What problems can we solve for you?"

"Getting our projects to market more quickly," is the inevitable answer.

In the AEC world, Partha has discovered that projects are often delayed due to two main reasons – inappropriate communication and lack of scientific project management.

Discovering 3D printing

Just two years ago, however, Partha discovered a technology that offered an entirely fresh way to compress time to market for architects and everyone involved in building projects: 3D printing.

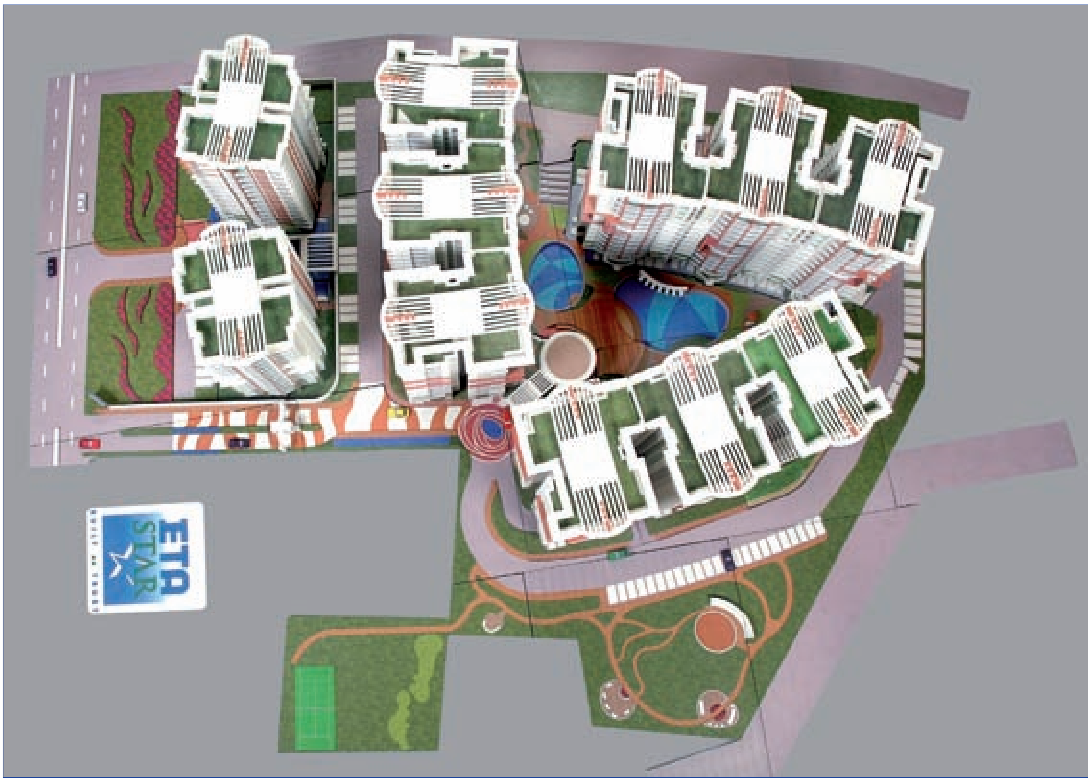
3D printing could provide on-demand identical sets of three-dimensional physical models of buildings and communities at every stage of a project to every stakeholder. Partha instantly realised that this would dramatically improve communication, increase efficiency and eliminate costly errors. Thus was born iKix, India's first service bureau chain for architectural 3D printing.

Based in Chennai, capital of Tamil Nadu, iKix serves top Indian architects and construction companies like Hiranandani, ETA Star and L & T South City. Though based in India, iKix is a global company. It accepts orders online and delivers models in the United States through its partner IDEAL Scanners & Systems. iKix has created about 200 architectural models for US customers alone.

Rising to the challenge

The traditional method for creating an architectural model is handcrafting in cardboard or Styrofoam. Because of the long lead time and expense required to produce such a creation, architects usually commission these models only when it's time to reveal final plans to the public.

iKix, however, can '3D print' a typical project in six to ten days, far less than the month that handcrafting a model requires, according to Partha. "In fact, we can print a model of a community of 1,000 acres – including homes, schools, churches, temples, golf courses and more – in six weeks versus five months for handcrafting the model," he says. "The time and cost advantage is even more pronounced when plans change and models need to be modified on the fly."



Above and above right: ***3D printing helped highlight concerns about over-crowding in this urban residential project. As a result, and much earlier on in the design process, the architect moved a pool and fitness club into the centre of the site to ease congestion.***

3D printing's value stems from its breakthrough ability to print three-dimensional physical objects from 3D data. It operates in much the same way as a traditional office printer produces documents from word-processing data. iKix uses the Spectrum Z510 full-color 3D printing system from Z Corporation of Burlington, Massachusetts, maker of the world's fastest 3D printers and the only ones capable of printing in multiple colors.

The Z510's agility enables architects and project managers to quickly obtain multiple physical models of a project – one for the architect, the client, the general contractor, the subcontractors and the civil authorities. "A 3D printer is more than a prototyper," says Partha. "It has become a project management tool."

The way we think

Architects and contractors have traditionally worked from 2D plans. While seemingly precise, 2D plans in fact lend themselves to interpretation – and thus misinterpretation. "The human mind thinks in three dimensions, not two," explains Partha.

"The architecture community communicates in two dimensions only because there hasn't been a viable technology for readily communicating in three dimensions until now. 3D printing is a breakthrough that I believe will redefine technical communication for the next 200 years. Every design should be represented in 3D, and soon will be. It is my sincere desire that all architects move to 3D soon. Every customer of iKix has come back repeatedly for subsequent projects. They have found the benefits irresistible."

Consider a typical large residential community. It takes perhaps three months to design and 15 months to build. Two months into construction, with all trades working from 2D blueprints, the architect sees something amiss due to a misinterpretation of the plans: a misplaced wall or a staircase headed for a support column. The choices are 1) tearing everything down after 20 percent of the project is built, incurring major loss of time, labour and material; or 2) accepting the mistake and continuing construction. Neither option works. Handcrafted models don't solve the problem. They are approximations of the plan while a 3D printed model essentially is the plan.

"What is intended in plans is often starkly different from what is executed," observes Partha. "That's why iKix clients are commissioning 3D printed physical models from the earliest stages of the design and avoiding these catastrophes. Clients bring us in early and start making models from the concept stage,

> **"What is intended in plans is often starkly different from what is executed. That's why iKix clients are commissioning 3D printed physical models from the earliest stages of the design and avoiding these catastrophes."**
> **R. 'Partha' Parthasarathy,** *owner and founder of iKix*



which is yielding project management savings in the three to eight percent range, which is huge given the size of their construction budgets."

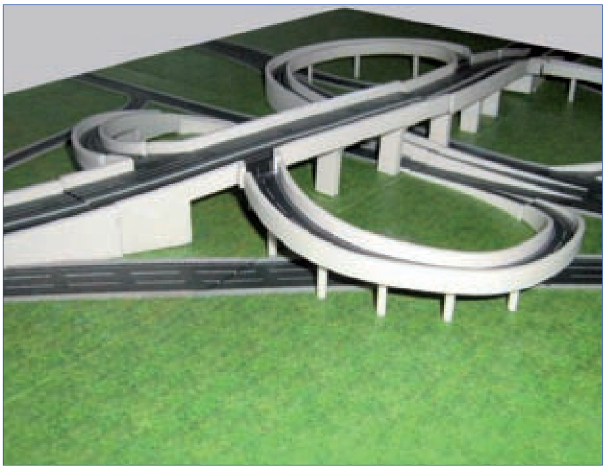
Chander Seetaraman, CEO of CS Designs, a top design firm in India and an early iKix user confirms the cost benefits of 3D printing: "The value of the iKix models are really in the time and money saved due to cost and time overruns avoided. They pay for themselves right at the early stages of the project."

Partha offers the example of a recent urban residential project with hundreds of clustered units. The client was happy with the plans, but when he saw the iKix model, he immediately worried the units were too crowded together. The architect moved a pool and fitness club into the center of the site to ease the congestion. This is a solution that all parties would have otherwise missed – until the buildings were halfway to completion.

Civil engineering projects need physical models, too, according to Partha. When officials are planning to build a highway overpass, for example, they must plan temporary traffic flows over the various phases of the job. Having 3D physical models for every stage eliminates confusion and improves construction efficiency.

Options and changes are easy

Unlike hand modellers, iKix is able to present clients with multiple options for projects at the earliest stages. "If you present a client with four design options," Partha says, "a client is likely to choose a fifth by requesting elements of the first four." Not only can iKix print that fifth option on demand, clients can move 3D printed models of buildings, pools and parking lots around at will so they can reconfigure a design on the spot. That's because iKix purposefully builds its models in a modular fashion. Handcrafted models, by contrast, are fragile and glued in place, often with an off-putting 'do not touch' warning.



The modular nature of iKix models, such as this freeway, makes them simple to pack, transport and reassemble.

The modular nature of iKix models also makes them simple to pack, transport and reassemble at different venues for different audiences. A model used for obtaining building permits, for example, can be packed up and reassembled in the sales office for prospective occupants to view.

Because 3D prints emerge directly from CAD data, they are more accurate than handcrafted models, and it's easy to make multiple copies – almost unheard of in hand modelling. It's also easy to scale models up or down without losing data.

iKix chose the Spectrum Z510 because of Z Corporation printers' unique ability to print in multiple colours. This is an essential capability for non-technical audiences as well as painting contractors, decorators and exterior contractors. Colour is also essential for applying labels and texture to models for maximum impact.

"Full-colour, 3D printing offers so many advantages," says Partha. "It communicates information directly in the way humans think so they can fully, deeply understand what the project will look like and what the project will be like. How can an architect not take advantage of 3D printing when it will save money and save time? I ask customers to just try it once. When they do, the benefits are overwhelmingly obvious, and they call us in from the beginning of the next project – not as a vendor but more as a partner. Like the architect."

Remember, says Partha: "Project efficiency decreases quite rapidly as the number of stakeholders increases. Proper communication is therefore key to managing projects well. iKix 3D prints are a great way to increase project execution efficiencies."

www.zcorp.com

Océ CrystalPoint

It's not often a new print technology comes along and certainly not one that promises so much. CrystalPoint from Océ is being seen by many as the future of wide format colour printing, a bold statement for a technology that distributes its ink by rolling balls down a chute. By **Greg Corke.**

Oce's new CrystalPoint technology is designed to bridge the gap between LED and inkjet, offering full colour output at speeds never seen before. It has been in development for over 10 years at an estimated cost of €150 million. With that kind of money behind it and with a company the size of Océ at the reins, CrystalPoint's unveiling last month in Venlo sent ripples through the wide format print industry.

CrystalPoint technology is not dissimilar to inkjet insofar as it jets tiny droplets of ink (gel) on to paper. But unlike the de-facto wide format colour standard, which needs specialist coated paper, it does this onto plain paper.

Instead of ink or powder-based toner, CrystalPoint uses solid colour toner balls made out of resin. Each TonerPearl is about the size of a small marble and is delivered to the imaging device by rolling down a delivery chute. When each TonerPearl reaches the imaging device it is heated and turns into a toner gel, which is then jetted onto the plain paper in tiny droplets much like an inkjet. However, unlike standard inkjet ink, Océ's TonerPearls include a special agent, which crystallises once it has adhered itself to the media. The result is an instant dry print with a stronger bond and a semi gloss silk finish. Prints are also waterfast, which makes them ideal for use on site.



Left: ***With six media rolls, four 500g CMYK cartridges and a top delivery tray for 100 prints, the ColorWave 600 has 'production-level colour printer' written all over it.***



Below: ***The Océ ColorWave 600's CMYK cartridges are packed full of resin-based TonerPearls. These are delivered to the imaging device by gravity as and when required.***

Océ ColorWave 600

CrystalPoint is the technology, but the first product to come to market is the ColorWave 600, a 42-inch (A0+) capable wide format printer with a price tag from £30,000. It delivers a single colour linework A0 drawing in a breathtaking 31 seconds, which is about twice as fast as a top-end inkjet, though Océ says it really comes into its own in terms of throughput when delivering full colour prints.

Backing up this raw print speed, the ColorWave 600 is all about production level printing. It has capacity for six media rolls, each containing up to 200 metres of plain paper and four 500g TonerPearl cartridges (CMYK), which sit in clear cartridges on the top of the machine. A top mounted delivery tray has capacity for 100 prints and an optional folder and stacker are borrowed from Oce's volume monochrome devices.

In terms of job delivery, Océ's new Print Assistant software helps choose the correct print mode by analysing each job as it is sent and adjusting the settings for draft, production, or presentation. In terms of quality, there is very little between linework prints in draft and presentation mode, so this is a useful way to enforce ink savings.

Print quality

When compared with a typical inkjet, the ColorWave 600 does not offer the same level of print quality, but it is still good. While linework is excellent, the output colours on renderings or photographs lack a little vibrancy.

However, inkjet technology sets incredibly high standards and to achieve best results you need to print on photo quality paper. It shouldn't be forgotten that the ColorWave 600 uses plain paper and the silk finish, which means there are no reflections under bright office lighting, will also appeal to many users.

For the past decade and beyond, the technical wide format printing market has been served by two core technologies, inkjet and LED. Colour inkjet is great for producing photo quality prints but it is relatively slow so not ideally suited to a production environment. It also requires special coated paper for best results. LED, on the other hand, delivers incredibly sharp prints on plain paper. It is also extremely quick with some machines churning out over ten A0s per minute. The downside is that it does this in monochrome only.

Oce's CrystalPoint looks to offer the best of both worlds – production level printing in full colour. It is not up there with LED in terms of speed, but the benefits of full colour shouldn't be underestimated in terms of its ability to communicate designs. For years engineers and designers have sacrificed colour for throughput. With Oce's CrystalPoint there's now a platform on which to find the middle ground and while the first generation product doesn't quite tick all the boxes when it comes to speed and quality, it's certainly a groundbreaking technology and one which will be extremely interesting to track in the coming years. ***www.oce.com/colorwave***

Hardware review

Product: ColorWave 600
Supplier: Océ
Price: From £30,000



The new HP
Designjet T610

The new HP
Designjet T1100



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WHAT DO YOU HAVE TO SAY?